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CIS

TRANSFER OF TECHNOLOGY FROM FEDERAL LABORATORIES

HEARING

BEFORE THE

SUBCOMMITTEE ON TECHNOLOGY AND COMPETITIVENESS

OF THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY HOUSE OF REPRESENTATIVES

ONE HUNDRED SECOND CONGRESS

FIRST SESSION

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*Ranking Republican Member.

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TRANSFER OF TECHNOLOGY FROM FEDERAL LABORATORIES

THURSDAY, MAY 30, 1991

House of Representatives,
Committee on Science, Space, and Technology,
Subcommittee on Technology and Competitiveness,
Washington, DC.

The subcommittee met, pursuant to call, at 9:35 a.m., in room 2318, Rayburn House Office Building, Hon. Ray Thornton (acting chairman of the subcommittee), presiding.

Mr. Thornton. The hearing will come to order.

This morning, the Subcommittee on Technology and Competitiveness will focus on the current technology transfer efforts of our Federal agencies and laboratories as mandated by the Federal Technology Transfer Act of 1986, the Executive Order 12591 of April 10, 1987, and the National Competitiveness Act of 1989.

It is estimated that the Federal Government will spend over $60 billion on research and development in fiscal year 1991, with much of that scientific research taking place within our Federal laboratories. The question is: How can we achieve the national maximum benefit from that expenditure?

Since the Government has neither the mandate nor the capability to commercialize the results of the Federal research and development effort, technology transfer is a means to get these results out into the private sector where they can be developed, commercialized, and contribute to the economic growth of the United States.

Recent studies have shown that our economy, although strong, is losing ground in several areas of competition. One of the ways we can enhance America's competitive stance is by facilitating the application and commercialization of innovative technologies. When technology transfer is successful, new and different products or processes become available to meet or generate market demands.

I view the technology transfer effort as a part of a Marshall Plan for America, an opportunity for this Nation to develop a set of comprehensive and interrelated strategies to ensure that we remain the mightiest nation on earth militarily, the strongest economically, and the greatest in terms of personal freedom, dignity, and democracy.

This hearing continues the focus of a subcommittee hearing held last year on the implementation of the 1986 Act. At the request of the Science Committee, the General Accounting Office developed questionnaires for library and agency personnel to be used as criteria for future reporting requirements. The General Accounting Office used the questionnaires to survey the Federal laboratories and agencies to determine the status of implementation and presented an interim report of their findings.

However, since the response rate of both the agencies and the laboratories was considerably less than 100 percent, the GAO report was inconclusive. Follow-up letters were sent to the noncompliants requesting their response to the questionnaire. A GAO representative will present a final report of their findings this morning.

In addition to GAO, testimony will be heard from several Federal agencies who have been asked to respond to the report and give an update on their current technology transfer activities and from a not-for-profit organization representative who will describe a unique pilot technology transfer project.

I would like to express my personal appreciation to Chairman Tim Valentine for allowing me to chair this hearing, which does result from an initiative that I began with Dr. Betsy Ancker-Johnson a few years ago in developing a uniform patent policy for the United States, which led to the Stevenson-Wydler Act and which has moved quite a distance down the track, changing our focus as a nation from the past practices of considering adversarial relationships to a concept that we needed to learn how to use our inventive genius to stimulate economic productivity. I do thank the Chairman of the Subcommittee for that opportunity.

I want to welcome all of our witnesses on all three of our panels, and at this time I would like to recognize the ranking Republican member of this committee, Mr. Lewis, for such statement as he may wish to make.

Mr. LEWIS. Thank you, Mr. Chairman.

Today's hearing will review the status of implementation of the vital Federal Technology Transfer Act. This important Act is vital to our efforts to improve the United States' competitiveness. The Act has as its goal to assure the Federal lab research advances are transferred to the private sector as soon as possible for commercialization.

Many of the hearings held by the Technology and Competitiveness Subcommittee this year point out over and over again that the United States is the world's leader in basic science research but falls woefully short in translating that into commercial success.

At last year's hearing on the Act, there were questions raised about the speed with which the Federal Government had implemented the Act. These questions still remain. However, it appears that progress is being made.

I look forward to hearing the General Accounting Office's assessment of the progress and the agency witnesses testifying to the strengths and weaknesses of Federal policies to implement the provisions of the Act.

Thank you, Mr. Chairman. Welcome aboard.

Mr. THORNTON. Thank you very much, Mr. Lewis.

The gentleman from Indiana, Mr. Roemer.

Mr. ROEMER. Thank you, Mr. Chairman.

I would just like to take a few minutes to salute your leadership in this area, Mr. Chairman. The New York Times said in an article a couple of weeks ago the gentleman from Arkansas, Mr. Thornton, has provided leadership not only in his past service to Congress but now recently as one of the freshman Members leading the way on this new Marshall Plan that we need to reinvigorate this country and get this country moving in the right direction in terms of technology transfer, in terms of educational leadership, in terms of innovative consortiums built between academia, the business sector, and the educational institutions within businesses. Fortune magazine, I think this week, talks about the new American century and the challenges that we face as a country, and I look forward to the Chairman's leadership here not only in the 1970's but in the 1990's and salute you for this hearing, Mr. Thornton, and look forward to working with you on this Marshall Plan for this country.

Mr. THORNTON. Thank you very much. It is a privilege to work with you in this effort, and I appreciate your leadership.

Mr. Gilchrest.

Mr. GILCHREST. Thank you, Mr. Chairman.

I, unfortunately, have two more hearings, and all three are at the same time; I won't be able to stay very long. But I did want to come in and commend this idea of joint venture thinking.

I am from a very rural area, and I am interested in the joint efforts of agriculture, how we can reduce the amount of pesticides, herbicides, fertilizers that are used. I know they are an essential part of our agricultural program at this time, but if we can continue to improve that, we can lessen run-off and all of the things that occur as a result of those chemicals being used and improve the quality of the food and the life around the farms.

So I will read the testimony and thank you all for coming.

Thank you, Mr. Chairman.

Mr. THORNTON. Thank you, Mr. Gilchrest.

The representative from the State of Missouri, the gentleperson Joan Horn.

Ms. HORN. Thank you, Mr. Chairman, and I'm delighted to be here today to speak to this very important topic on technology and competitiveness.

We have heard much testimony during this subcommittee's hearings, and apparently where our biggest gap is in taking this technology out of the lab. We seem to be able to invent it here and to develop it, but someone else makes the product.

The Federal Technology Transfer Act was meant to address this, and we are going to hear from people today and have read some of the paperwork ahead of time about what is happening in the various Federal agencies and labs toward implementing the responsibilities in the Act. So I am very interested in hearing about that during today's testimony.

Also, it has great relevance for the St. Louis area. We are in a recession there. We have had up to 10,000 lay-offs from McDonnell Douglas alone; we have had a Chrysler plant close just last week with 4,000 jobs. We have a lot of very skilled workers in our area who are having great difficulty, and anything we can do to transfer technology from the labs into products will take advantage of these skilled workers.

We have—the St. Louis Economic Council has—a grant proposal in now to try to get some funding to help with some of these conversions with in the defense industry, so I am looking forward to their getting the funds to be able to try to figure out ways to assist the defense industry in working with some of those technologies. So I look forward to today's witnesses.

Thank you.

[The prepared opening statement of Ms. Horn follows:]

Opening Statement for Joan Kelly Horn
Before the Subcommittee on Technology and Competitiveness
May 30, 1991

Mr. Chairman, distinguished colleagues, and witnesses, I can think of no more important topic in technology and competitiveness than how we can better transfer the discoveries made in our research labs to the private industry. It is vital to our future economic health and standard of living.

Time and again, as I have listened to testimony presented in this subcommittee, I have heard that this is where the biggest gap in our competitiveness occurs. While as a nation we excel in basic science, we seem to be failing in reaping the economic rewards of our scientific discoveries through the production of consumer goods. We make the discoveries, someone else makes the products.

The Federal Technology Transfer Act (FTTA) of 1986 was meant to address this problem. It is important for our future competitiveness to determine how well this law is working to facilitate technology transfer in this nation. Are individuals in federal agencies and labs working toward implementation of their responsibilities under the act? Which labs are successfully accomplishing their mission in this regard, and how can other labs implement their procedures? What problems remain in the successful transfer of technology to private sector businesses, especially small businesses? Is there a role for university, federal laboratory and business consortia in technology transfer? Are there ways to help businesses pool resources for particularly risky ventures? I look forward to today's hearing to answer some of these questions.

I also want to take this opportunity to mention the relevance of technology transfer issues to the St. Louis area. At a time of economic recession and a major loss of jobs, programs to facilitate the transfer of technologies from the laboratory to the marketplace will create new jobs. This is especially important in my district where many highly educated and skilled workers are being laid off. Pilot programs which promote the use of advanced technology in civilian production will likely aid the employment of individuals who have lost jobs in the defense industry. The St. Louis County Economic Council is proposing a pilot program to assist defense industry firms in the St. Louis area to expand their operations to include new products. I would like the witnesses to address the question of how tech transfer can help in economic conversion from defense related production to civilian production.

Mr. THORNTON. Thank you, Ms. Horn, and we appreciate your contributions to this Committee and to this effort.

The gentleman from Michigan, Mr. Henry.

Mr. HENRY. Thank you, Mr. Chairman.

Mr. Chairman, thank you for rearranging the panel sequence, because I have an entire panel of witnesses coming up in about 30 or 40 minutes over at the Education and Labor Committee, so it is ironic that both were scheduled for the same day, and I appreciate your accommodation.

Today, I would want to welcome Mr. George Kuper, president of the Industrial Technology Institute in Ann Arbor, Michigan—and it is "cooper,"not "cupper," because of the spelling, so you don't get tricked—who will be testifying on this panel. The ITI has become the largest organization in the United States devoted to the translation of manufacturing research concept to practical factory floor implications.

I just want to comment in passing on the gentlelady's remarks on the lay-offs in her plants in her district. We have had our share of that in Michigan. However, in my Congressional district in the Grand Rapids area and in the Ann Arbor corridor, where the ITI is headquartered for its technology transfer efforts, it might be of interest to the committee to know that my area is the only snow belt area in the United States that has more manufacturing jobs now than pre-1981/1982 recession, a rate of unionization that is above the national average, all the changes in the auto industry, but it demonstrates that if we work at technology transfer, it is not simply meaning we are going to have only white-collar, lab coat jobs, but, in fact, the manufacturing environment can be transformed and we can compete with these kinds of technologies.

Earlier this year, the Department of Commerce chose the ITI as one of their select few regional manufacturing technology transfer centers along with the Applied Technology Center in West Michigan in my home district, and over the past 18 months the ITI has carried out a technology transfer pilot project with three of our Federal labs: Argonne, Pacific Northwest, and Mound Applied Technologies. This latter experience will be of great interest, I trust, to the members of our committee.

The concept of market pull transfer as opposed to technology push transfer is at the heart of ITI's work. We have ordered our Federal labs to establish technology transfer offices. We have done a great deal to facilitate access to science and technology, but in order to make technology transfers work effectively we need to create a two-way street. Our labs need to know what industry's technology needs are, our labs need to know what technologies might apply to certain industries, and such knowledge can expedite the technology transfer process.

The ITI pilot project has demonstrated how the technology transfer process could be refined internally for each Federal agency. However, when faced with constrained research budgets, most labs can't devote funds to such an undertaking. With the help of our colleague, Mr. Wolpe, the Energy Subcommittee did include funding for an expansion of this market pull technology transfer program in its authorization bill, and I hope the Appropriating Committee in the House and the Senate will take note of the Science

Committee's support for this program, Mr. Chairman, and I want to thank you for inviting the ITI and Mr. Kuper to be with us this morning.

Thank you very much.

Mr. THORNTON. Thank you very much. We appreciate your leadership and interest in this area and appreciate your bringing Mr. Kuper to our committee.

The gentlewoman from Maryland, Mrs. Morella. Do you have an opening statement?

Mrs. MORELLA. Thank you very much. I would like to make an opening statement, if I might, Mr. Chairman, because I think this is a very important hearing that we have, and I appreciate your leadership and am so pleased that you are here in Congress with us to continue with the role that you had in the private sector with regard to technology transfer.

I am delighted that we have this hearing on this very urgent issue of Federal technology transfer and the current implementation status of the Federal Technology Transfer Act of 1986.

Really, in order for American firms to produce optimum dividends in terms of new products, new processes, new jobs, and enhanced international competitiveness, we in Congress must continue to support technology transfer programs.

As the preliminary step in reaching this goal, the 99th Congress enacted the Federal Technology Transfer Act, which, as we know, utilizes one of our greatest national resources, our Federal laboratories. There are over 400 Federal labs throughout the Nation occupying one-fifth of the country's laboratory and equipment capabilities while providing employment for one out of every six scientists in the United States, and I have the distinct honor of representing four of our major Federal laboratories: the National Institutes of Health, the Food and Drug Administration, the National Institute of Standards and Technology, and the National Naval Center.

The technology act, the FTTA, allows our Federal laboratories to enter into collaborative ventures with other agencies, private industry, State and local governments, and nonprofit organizations through CRADA's, the Cooperative Research And Development Agreements.

In passing the FTTA, Congress intended to assure that the results of appropriate Government-conducted research become available commercially through the patenting and licensing of inventions and thereby contribute to our competitiveness in the world marketplace.

I am certainly very interested in hearing the testimony of our assembled witnesses today, especially the initial results of the GAO study. I have also had an opportunity to review in advance some of today's testimony, and I am extremely pleased that at least two of our speakers, Cherri Langenfeld from the Department of Energy, and Dr. Ronald Culpepper from the Office of Naval Technology, have made reference in their testimony to the urgent need for extending copyright protection to software works created by Federal employees as a means of promoting technology transfer.

This need has been addressed in H.R. 191, a bill which I have introduced. I can't resist mentioning that, Mr. Chairman. Passage of this bill would make another important step forward in creating effective mechanisms for the commercialization of Federally funded research. I believe the bill would have a significant impact on the commercialization of Federally developed computer software by removing the concerns that private firms might have if their collaborative work with the Federal labs may fall into the public domain and also by the encouragement of Federal employees, through incentives such as royalties, to develop commercially viable software as part of such collaborative research.

Mr. Chairman, an untapped potential exists for the Federal laboratories to provide a large human resource base, a vital source of basic and applied knowledge for technological development and an important source of funding for local industry. The continued support and development of technology transfer programs which can capitalize upon our Federal labs will create the framework for a new era of scientific cooperation between the public and private sectors.

I want to thank you for holding the hearings and for giving me the opportunity to comment on something I think that we all believe in, but at least I can say it for the record and for those who are here.

Thank you.

[The prepared opening statement of Mrs. Morella follows:]

CONSTANCE A. MORELLA
8TH DISTRICT, MARYLAND

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OPENING STATEMENT OF

CONGRESSWOMAN CONSTANCE A. MORELLA

HOUSE COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY

SUBCOMMITTEE ON TECHNOLOGY AND COMMITTEE

HEARING ON FEDERAL TECHNOLOGY TRANSFER

MAY 30, 1991

THIS STATIONERY PRINTED ON PAPER MADE OF RECYCLED FIBERS

OPENING STATEMENT OF
CONGRESSWOMAN CONSTANCE A. MORELLA

HOUSE COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY
SUBCOMMITTEE ON TECHNOLOGY AND COMMITTEE
HEARING ON FEDERAL TECHNOLOGY TRANSFER
MAY 30, 1991

MR. CHAIRMAN, I AM VERY PLEASED OUR SUBCOMMITTEE IS HOLDING HEARINGS TODAY ON THIS URGENT ISSUE OF FEDERAL TECHNOLOGY TRANSFER AND THE CURRENT IMPLEMENTATION STATUS OF THE FEDERAL TECHNOLOGY TRANSFER ACT OF 1986 (FTTA).

IN ORDER FOR AMERICAN FIRMS TO PRODUCE OPTIMUM DIVIDENDS IN TERMS OF NEW PRODUCTS, NEW PROCESSES, NEW JOBS, AND ENHANCED INTERNATIONAL COMPETITIVENESS, WE, IN CONGRESS, MUST CONTINUE TO SUPPORT TECHNOLOGY TRANSFER PROGRAMS.

AS THE PRELIMINARY STEP IN REACHING THIS GOAL, THE 99th CONGRESS ENACTED THE FEDERAL TECHNOLOGY TRANSFER ACT. THE FTTA UTILIZES ONE OF OUR GREATEST NATIONAL RESOURCES -- FEDERAL LABORATORIES. THERE ARE OVER 400 FEDERAL LABS THROUGHOUT THE NATION, OCCUPYING ONE-FIFTH OF THE COUNTRY'S LABORATORY AND EQUIPMENT CAPABILITIES, WHILE PROVIDING EMPLOYMENT FOR ONE OF EVERY SIX SCIENTISTS IN THE UNITED STATES. I HAVE THE DISTINCT HONOR OF REPRESENTING FOUR OF OUR MAJOR FEDERAL LABORATORIES - THE NATIONAL INSTITUTES OF HEALTH, THE FOOD AND DRUG ADMINISTRATION, THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY, AND THE NATIONAL NAVAL CENTER.

THE FTTA ALLOWS OUR FEDERAL LABORATORIES TO ENTER INTO COLLABORATIVE VENTURES WITH OTHER AGENCIES, PRIVATE INDUSTRY, STATE AND LOCAL GOVERNMENTS, AND NONPROFIT ORGANIZATIONS THROUGH COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS (CRADAs). IN PASSING THE FTTA, CONGRESS INTENDED TO ASSURE THAT THE RESULTS OF APPROPRIATE GOVERNMENT-CONDUCTED RESEARCH BECOME AVAILABLE COMMERCIALLY THROUGH THE PATENTING AND LICENSING OF INVENTIONS AND, THEREBY, CONTRIBUTE TO OUR COMPETITIVENESS IN THE WORLD MARKETPLACE.

I AM VERY INTERESTED IN HEARING THE TESTIMONY OF OUR ASSEMBLED WITNESSES TODAY, ESPECIALLY THE INITIAL RESULTS OF THE GAO STUDY. I HAVE ALSO HAD AN OPPORTUNITY TO REVIEW, IN ADVANCE, SOME OF TODAY'S TESTIMONY. I AM EXTREMELY PLEASED THAT AT LEAST TWO OF OUR SPEAKERS, CHERRI LANGENFELD FROM THE DEPARTMENT OF ENERGY AND DR. RONALD CULPEPPER FROM THE OFFICE OF NAVAL TECHNOLOGY, HAVE MADE REFERENCE, IN THEIR TESTIMONY, TO THE URGENT NEED FOR EXTENDING COPYRIGHT PROTECTION TO SOFTWARE WORKS CREATED BY FEDERAL EMPLOYEES, AS A MEANS OF PROMOTING TECHNOLOGY TRANSFER.

THIS NEED HAS BEEN ADDRESSED BY H.R. 191, A BILL WHICH I HAVE INTRODUCED. PASSAGE OF THIS BILL WOULD MARK ANOTHER IMPORTANT STEP FORWARD IN CREATING EFFECTIVE MECHANISMS FOR THE COMMERCIALIZATION OF

FEDERALLY-FUNDED RESEARCH. THE BILL WOULD HAVE A SIGNIFICANT IMPACT ON THE COMMERCIALIZATION OF FEDERALLY-DEVELOPED COMPUTER SOFTWARE -- BY THE REMOVAL OF CONCERNS PRIVATE FIRMS MIGHT HAVE THAT THEIR COLLABORATIVE WORK WITH THE FEDERAL LABS MAY FALL INTO THE PUBLIC DOMAIN AND ALSO BY THE ENCOURAGEMENT OF FEDERAL EMPLOYEES, THROUGH INCENTIVES SUCH AS ROYALTIES, TO DEVELOP COMMERCIALLY VIABLE SOFTWARE AS PART OF SUCH COLLABORATIVE RESEARCH.

MR. CHAIRMAN, A GREAT UNTAPPED POTENTIAL EXISTS FOR FEDERAL LABORATORIES TO PROVIDE A LARGE HUMAN RESOURCE BASE, A VITAL SOURCE OF BASIC AND APPLIED KNOWLEDGE FOR TECHNOLOGICAL DEVELOPMENT, AND AN IMPORTANT SOURCE OF FUNDING FOR LOCAL INDUSTRY. THE CONTINUED SUPPORT AND DEVELOPMENT OF TECHNOLOGY TRANSFER PROGRAMS WHICH CAN CAPITALIZE UPON OUR FEDERAL LABS WILL CREATE THE FRAMEWORK FOR A NEW ERA OF SCIENTIFIC COOPERATION BETWEEN THE PUBLIC AND PRIVATE SECTORS.

THANK YOU FOR HOLDING THESE HEARINGS. I LOOK FOWARD TO HEARING FROM OUR WITNESSES.

Mr. Thornton. Thank you very much, Mrs. Morella, and let me say for the record that I applaud your leadership in moving toward a copyright of computer software. I think it is important to our Nation to keep the inventive genius, whether it be in patents or whether it be in very real improvements in software, and I am looking forward to working with you in a bipartisan way to try and support the effort that you are making.

Mrs. Morella. I thank you. I think that is very crucial to its success. Thank you.

Mr. Thornton. Thank you.

At this time I would also like to enter Mr. Ritter's statement into the record.

[The prepared opening statement of Mr. Ritter follows:]

OPENING STATEMENT
HEARING ON TRANSFER OF TECHNOLOGY FROM THE FEDERAL LABORATORIES

HON. DON RITTER (R-PA)
MAY 30, 1991

Thank you, Mr. Chairman.

Over the last several years, the government has tried to overcome the numerous obstacles limiting the transfer of technology from the Federal labs to private industry. Congress has passed several laws to promote it; Presidential advisers and executive agencies have strongly urged it; and President Reagan signed an Executive Order laying out guidelines to accomplish it.

The results thus far of this collective effort have been positive but, I would have to say, on the whole disappointing. GAO found that in 1989 nearly 300 Federal labs reported 250 instances of technology transfer--on the average, less than one project per lab. It's obvious that our Federal Labs still have a long way to go before realizing their full potential as a major source of new commercial technology for industry.

I'd like to welcome our distinguished witnesses and their expert testimony. I look forward to hearing their ideas on how we can improve the effectiveness and efficiency of the Federal technology transfer effort; and on how we can get more of the exciting concepts and innovations generated in our $70 billion Federal research enterprise into American industry where they can benefit U.S. workers, consumers, taxpayers, and our international competitiveness. Thank you.

Mr. THORNTON. The testimony which has been prepared for our Committee has been distributed to all of the Members, and I think most of the Members have had an opportunity to read and study the testimony. So it will be, without objection, introduced into the record as though reported to us orally. There being no objections, it will be a part of the record.

I now ask each of our witnesses to summarize that testimony in order that we may proceed rapidly to the questions and answers which will help us to add to that record.

Our two main witnesses for this panel are Mr. Chan, who is presenting the Office of Technology General Accounting Office report. He is the director of program evaluation in the physical systems area, and we are very pleased to have you with us.

The next witness, Mr. Kuper, has already been introduced.

At this time, I would like to recognize Mr. Chan and ask you to identify your associates and to give us a summary of your testimony.

STATEMENTS OF KWAI-CHEUNG CHAN, DIRECTOR, PROGRAM EVALUATION IN PHYSICAL SYSTEMS AREA, U.S. GENERAL ACCOUNTING OFFICE, WASHINGTON, DC, ACCOMPANIED BY DR. FRANCINE E. JEFFERSON, STUDY PROJECT MANAGER, AND GERALD DILLINGHAM, STUDY DIRECTOR; AND GEORGE KUPER, CHIEF EXECUTIVE OFFICER, INDUSTRIAL TECHNOLOGY INSTITUTE, ANN ARBOR, MI

Mr. CHAN. Sure thing. Thank you, Mr. Chairman.

Let me introduce you to my colleagues. On my right is Dr. Dillingham, who is the study director of the study and on my left is Dr. Francine Jefferson, who is the study project manager.

Mr. THORNTON. You are welcome. All of you are welcome to the committee.

Mr. CHAN. Let me summarize.

It is a pleasure to be here this morning to discuss with you our evaluation on the implementation of the Federal technology transfer legislation and a related executive order. Let me go straight to how we did our work and what our findings are.

Our findings are based on questionnaires that we sent to the agencies and laboratories for the fiscal year 1989 and of which we obtained 297 laboratories' responses, representing 10 departments.

Mr. Chairman, my remarks this morning will focus on four areas: one, the laboratories' receipt of implementation guidance from their respective departments; two, establishment and staffing of Office of Research and Technology Applications in large labs, otherwise known as ORTA's; three, the departments' delegation of authority to laboratories to enter into CRADA's; four, the establishment of awards programs and other incentives for Federal laboratory personnel to engage in technology transfer activities.

Our findings: One, in terms of the receipt of departmental guidance, we found nearly 70 percent of all the labs, our 297, had received guidance from their parent departments for implementing the Act, but we found wide variations among the departments in the completeness of that guidance.

For example, all the HHS laboratories had received guidance, and more than 80 percent of the EPA and the USDA laboratories had received either final or draft guidelines, but less than 50 percent of the laboratories under the Department of Energy and Veterans' Affairs had received any type of written guidance.

Second, establishment and staffing of ORTA's. We found that every department has established ORTA's in all 10 of them. However, only 41 percent of the large laboratories—that is, those labs with 200 or more full-time equivalent scientific, engineering, and technical positions—had ORTA's located on their premises and staffed as mandated by the legislation.

On the plus side, we found also the ORTA directors generally are very experienced professionals. Nearly three-quarters had advanced degrees and an average of 21 years of work experience in their specializations.

Three: My third point involves the role of cooperative research and development agreements, the CRADA's, in successfully transferring new technologies. Data show that by 1989 approximately 44 percent of the laboratory directors had been delegated authority to enter into CRADA's. In other words, 56 percent didn't. And about 40 percent of all the labs had generated 685 draft and final agreements.

From our survey results beyond the CRADA's, we also found other types of formal arrangements through which a Federal laboratory cooperates with a non-Federal partner in research and development. These include contracts, memorandums of understanding, work-for-others agreements, and grants. Nearly 70 percent of the labs reported participation in over 22,000 such formal so-called non-CRADA agreements in 1989.

Lastly, the establishment of awards and other incentive programs, my fourth point. The technology transfer legislation reinforced by the executive order call on departments to establish incentives to laboratory scientists, engineers, and technical staff to encourage them to share their inventions. Such incentives could include awards programs, a share in the profits made in the inventions, and, finally, personnel exchange programs.

We found that most of the departments had not complied with this legislative provision to establish a distinct award program for technology transfer activities. Only three out of the 10 departments report such a program.

We found also that among our respondents royalty-sharing programs had been established in slightly less than one-half of the laboratories, and royalty payments of nearly $800,000 were distributed to 313 inventors in 1989.

Finally, the personnel exchange programs have been instituted in 76 percent of the laboratories, and in 1989 slightly more than 14,000 scientists and engineers had participated in this program. However, these programs are primarily a one-way exchange. That is, 88 percent of them consist of non-Federal scientists visiting Federal labs. Of that 88 percent, we found 70 percent were visiting scientists from U.S. academic institutions and industries and 22 percent of visiting scientists come from foreign countries.

What has resulted is really effectively a visiting scholar program as opposed to a balanced exchange. The exchange programs seem to have achieved only limited success as an incentive to Federal laboratory personnel.

My concluding comments: In conclusion, our survey has shown that the level of implementation of the technology transfer legislation has been uneven across the Federal departments and varies by legislative or executive order provision. We saw things that range from a third to 76 percent.

We believe that the fact that nearly one-third of laboratories had not received implementing instructions from their respective departments and slightly more than one-half, or 56 percent, of the lab directors had not been delegated authority to enter into CRADA's are significant contributory factors to the uneven level of implementation we found.

There have been, however, some notable successes and useful lessons learned. We received many examples of testimonies of dedicated and competent professionals working in many laboratory ORTA's to foster technology transfer. More private firms and universities have formed cooperative research and development agreements to establish the links to the Federal laboratories, and overall more Federal laboratories and their personnel are actively involved in tech transfer activities and are being rewarded for their efforts.

From our studies perspective, a continuing concerted commitment to both the substance and the spirit of the technology transfer legislation by the departments of the Federal labs is needed for full implementation. Additionally, a comprehensive education and outreach effort will be a necessary, though not a sufficient, step to address the real or perceived barriers to technology transfer that remain. The Congress and the executive branch will have to continue to monitor the level of implementation through Congressional oversight activities and the Federal reporting requirements of the legislation.

The information that we have collected on implementation is necessarily a beginning step in examining the overall impact of tech transfer, but does not, of course, assess that impact. It is important to have full implementation of the legislation before such a comprehensive evaluation or effectiveness can be undertaken.

It is especially important in the case where the life cycle of the program's output includes the movement of ideas to the level of innovations and the subsequent movement of the innovations to the commercialization of products. We believe it would take at least another year or so before such an impact evaluation could be started, and this ends my opening statement.

Thank you.

[The prepared statement of Mr. Chan follows:]

United States General Accounting Office

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Testimony

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Diffusing Innovations: Implementing the Technology Transfer Act of 1986

Statement of
Kwai-Cheung Chan
Director of Program Evaluation in
Physical Systems Area
Program Evaluation and Methodology Division

Before the
Subcommittee on Technology and Competitiveness
Committee on Science, Space, and Technology
House of Representatives

Mr. Chairman and Members of the Subcommittee:

It is a pleasure to be here this morning to discuss with you our evaluation of the implementation of the federal technology transfer legislation and a related executive order. Specifically, we examined how well federal departments have complied with selected elements of the Stevenson-Wydler Technology Innovation Act of 1980 (P.L. 96-480), as amended by the Federal Technology Transfer Act of 1986 (P.L. 99-502), and the April 1987 Executive Order No. 12591: "Facilitating Access to Science and Technology."

Over the last 10 years, the General Accounting Office has examined numerous issues related to federal technology transfer activities. We have provided the results of our efforts in four separate reports and two testimonies before this Subcommittee. (See appendix I.) Our testimony today represents our most comprehensive assessment of the implementation of the current legislation.

BACKGROUND

The term "technology transfer" has not been uniformly defined across the federal departments. It is generally used to refer to one of two principal types of transfer: either a direct transfer, where research is conducted and developed for a specific client group inside or outside the department, or a "spin-off" (that is, a secondary use), where new technology is marketed for a use other than the one originally intended. The term also applies to a variety of transfer methods ranging from the publication of research results to hands-on technical assistance.

As intended by the Congress, the Stevenson-Wydler Technology Innovation Act of 1980 was the impetus for major change in the interactions between federal laboratories and private industry. The 1980 act gave laboratories the specific mission of transferring new technologies and required them to establish Offices of Research and Technology Applications (ORTAs) to effect the transfers.

The Federal Technology Transfer Act of 1986 amended the Stevenson-Wydler Act and provided incentives to encourage industry, universities, and the federal laboratories to work cooperatively. Specifically, it granted permission for departments to authorize laboratory directors to enter into cooperative research and development agreements (CRDAs) with universities and the private sector. To further encourage technology transfer and the commercialization of federal R&D results, the Technology Transfer Act also required departments to create awards and royalty-sharing programs for federal scientists, engineers, and technicians.

The executive order reiterated many of the provisions of the technology transfer legislation and also provided for an exchange program for scientists and engineers between the private sector and federal laboratories.

Mr. Chairman, the Subcommittee asked us to develop a plan for assessing federal technology transfer activities. In response, we analyzed the relevant legislation and executive order and designed questionnaires for federal departments and laboratories. We reported our preliminary findings to the Subcommittee in testimony on May 3, 1990.

The questionnaires contained over 100 questions, covering the five areas of: (1) research and technology transfer activities; (2) ORTA characteristics and activities; (3) patents, licenses, and royalties; (4) federal laboratory consortium activities; and (5) laboratory staff, personnel exchanges, and training. Our findings are based on data for fiscal year 1989 collected from 297 federal laboratories representing 10 federal departments.[1] We believe the information we collected in 1989 provides a reasonably accurate determination of the extent to which provisions of the legislation and the executive order had been implemented at that time.[2] The complete results of our survey are provided in our report, Diffusing Innovations: Implementing the Technology Transfer Act of 1986 (GAO/PEMD-91-23, May 1991).

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[1] In our study, cabinet-level departments (for example, the Departments of Defense (DOD) and Commerce) and the two independent agencies (National Aeronautics and Space Administration (NASA) and the Environmental Protection Agency (EPA)) are treated as "departments." The term "agency" refers to, for example, the Agricultural Research Service of the Department of Agriculture (USDA) or the Food and Drug Administration of the Department of Health and Human Services (HHS). See appendix II for a list of departments and agencies in the study population.

OVERVIEW OF FEDERAL IMPLEMENTATION

Briefly, we found that although all the federal departments that we contacted had taken steps to implement the technology transfer legislation and the executive order, none had achieved full implementation. The level of implementation varied by department and legislative provision. Overall, laboratories in 7 of the 10 departments that we contacted had met at least 50 percent of our measures for implementation. The Environmental Protection Agency, followed by the Department of Energy (DOE), and the Department of Transportation (DOT) had the highest level of implementation, and Interior and the Department of Veterans Affairs (VA) had the lowest.[3]

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[2] All references to the year in our results pertain to the fiscal year.

[3] Our measures of implementation are based on weighted averages of the number of laboratories within a department, as determined by the legislation and executive order, that met the following criteria: (1) received implementation guidance from headquarters; (2) received authorization to enter into cooperative R&D agreements; (3) established Offices of Research and Technology Applications, if required; (4) staffed the ORTAs with at least one full-time position, if required; and (5) established awards, royalty-sharing, and personnel exchange programs.

Some provisions were fully implemented in some departments. For instance, all HHS laboratories had received written implementation guidance and all EPA laboratories had established personnel exchange programs. In some departments, certain provisions had not been implemented at all. For example, not one of the Commerce, Interior, EPA, HHS, USDA, or VA laboratories had established and staffed laboratory-level ORTAs.[4]

Across all 10 departments, nearly 70 percent of the laboratories had received written guidelines for implementing the act. Each of the departments had established an ORTA either at department headquarters or at the laboratory level. However, only slightly more than 40 percent of the large laboratories; that is, those with 200 or more full-time-equivalent scientific, engineering, and technical positions, had ORTAs located on their premises and staffed as mandated by the legislation. Only 44 percent of the laboratory directors had received authority from their department to enter into CRDAs. The majority of the departments had established a distinct technology transfer awards program, although other incentive programs had been created.[5]

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[4] A department head may waive the staffing and funding requirement if he or she submits to the Congress, at the time the President submits the budget, an explanation of the reasons for the waiver and alternate plans for conducting the technology transfer at the agency.

[5] The legislation mandated that each federal department that is making expenditures at a rate of more than $50 million per fiscal year for research and development in its government-operated laboratories develop and implement a cash awards program to reward its scientific, engineering, and technical personnel.

With that overview, I would like to turn now to a more detailed discussion of our findings on the selected provisions and how they have been implemented by the departments and the laboratories. My remarks this morning will focus on four areas: (1) laboratories' receipt of implementation guidance from their parent departments; (2) the establishment and staffing of Offices of Research and Technology Applications; (3) the departments' delegation of authority to laboratories to enter into cooperative research and development agreements; and (4) the establishment of awards programs and other incentives for federal laboratory personnel to engage in technology transfer activities.

PRINCIPAL FINDINGS

Receipt of Departmental Guidance

An important prerequisite to the successful implementation of any legislation is that information about its provisions and the procedures to be used for operationalizing them be communicated to those individuals and organizations that must comply with them. Providing guidance not only has substantive value, but it also serves to show laboratory personnel the commitment of department or agency headquarters to the spirit of the legislation.

The majority of laboratories had received guidance from their parent departments for implementing the act, but we found wide variations among the departments in the completeness of that guidance. For example, all HHS laboratories had received guidance; more than 80 percent of the EPA and USDA laboratories had received either final or draft guidelines, but less than 50 percent of the laboratories under the Departments of Energy and Veterans Affairs had received any type of written guidance.

Establishment and Staffing of ORTAs

Turning to my second point: establishing and staffing offices to effect the transfer of new technologies is a complex process that involves many stages and many variables. Often the participants do not know or understand each other's work environment, procedures, terminology, rewards, or constraints. It has been argued that the transfers are most successful when they involve one-on-one interaction between a committed individual in the laboratory and a counterpart in industry or state or local government. "Enthusiasts" are the ones needed to see a transfer through to completion since doing so is often a time- and energy-consuming process. The Congress recognized this relationship in mandating the establishment of ORTAs and their staffing requirement.

As I stated earlier, every department has established an ORTA. However, the other legislative requirements related to ORTAs have not been fully met. We found that only about two-thirds of the large laboratories had ORTAs at the laboratory level. Of these, about one-third did not have at least one full-time position assigned to staff the ORTA. Forty-eight percent of the staff positions in laboratory-located ORTAs were assigned as a collateral duty, but on the plus side, the ORTA directors, generally, were experienced professionals. Nearly three-fourths had advanced degrees and an average of 21 years of work experience in their specialization.

We also found that all of the laboratory ORTAs carried out, to some degree, the activities that the legislation prescribed for those offices. They were especially active in the dissemination of information on laboratory activities to state and local governments and private industry. Some respondents to our questionnaire reported handling several hundred telephone inquiries for technical assistance. Significant efforts were also devoted to coordinating with other federal ORTAs, evaluating the potential of the laboratory innovations, and providing assistance to the laboratory staff in the transfer of these innovations. For example, several respondents reported that the ORTA was essential to moving their innovation from the laboratory, through the patenting process, to establishing links with potential partners for commercialization.

In summary, our data suggest that the ORTAs that have been established are generally working as the legislation intended. At the same time, however, we have found that some ORTAs are not appropriately located or staffed to meet the objectives of the legislation. Because of the critical role that the ORTA plays in the technology transfer process, we believe that those departments that have not been granted a waiver of the ORTA provision should take immediate steps to locate and staff ORTAs as mandated by the legislation.

Delegation of Authority to Enter Into CRDAs

My third point involves the role of cooperative research and development agreements in successfully transferring new technologies. Before the 1986 act, organizational and legal constraints were among the major reasons put forth to explain why the fruits of federal laboratory research were not being shared with the private sector. Delays in finalizing collaborative arrangements and patent licensing agreements between federal laboratories and private industries were seen to be a consequence of the centralization of this function at department headquarters. The CRDA provisions of the act were intended to obviate these delays by delegating authority to laboratory directors to manage and promote the results of their research.

Our data show that by 1989, approximately 44 percent of the laboratories had been granted the authority to enter into CRDAs. This overall percentage masked the extremes of implementation across the departments. For example, EPA, HHS, NASA, and DOD had given authorization to more than half of their laboratories.[6] The remaining departments had only authorized between 34 and 43 percent of their laboratories to enter into CRDAs.

About 40 percent of all labortories falling under the provisions of the 1986 act had either finalized or were in the process of negotiating cooperative agreements in fiscal year 1989, resulting in 685 draft and final agreements. HHS accounted for the highest percentage of CRDAs (26 percent), followed by DOD (19 percent). The Department of Transportation had no CRDAs.

Cooperative R&D agreements varied with regard to duration, discipline, and partners. The projected life of most CRDAs was more than one year, but less than three; the trend seemed to be toward agreements of longer duration. A wide variety of disciplines, such as biological sciences and computer science, were represented in the CRDAs. Both draft and final CRDAs tended to focus on applied research and testing and evaluation; the least emphasis was given to clinical research. The majority of CRDA partners were U.S. businesses (85 percent of the draft CRDAs and 63 percent of final CRDAs), while less than 10 percent were with foreign partners. The types of industrial partners varied as well, including agriculture and medical instruments and supplies.

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[6] All of the DOE laboratories in our study population (N=3) reported having been authorized to enter into CRDAs.

From our survey results, we also found other types of formal arrangements through which a federal laboratory cooperates with a nonfederal partner in research and development. These include contracts, memorandums of understanding, work-for-other agreements, and grants. Nearly 70 percent of the laboratories reported participation in over 22,000 such formal "non-CRDAs" in 1989.

The linkages established through these types of non-CRDAs between federal laboratories and industry are important, since they assist in the development of products of potential use to the partners or industry at large.

Our analysis found a positive relationship between those laboratories that had received authorization from headquarters to enter into CRDAs and those laboratories that were involved in draft or final CRDAs. That is, the laboratories with authority were more likely to be involved in draft and final CRDAs than those that had not received authorization. This suggests that the new CRDA authority is serving the purposes intended by Congress -- to stimulate R&D cooperation between federal laboratories and the private sector.

Nonetheless, the low level of implementation of this provision is especially troublesome because laboratories were not required to wait to receive authority from headquarters. The legislation encouraged them to proceed, and not delay until headquarters had issued guidelines and regulations. Therefore, the responsibility for the low level of implementation for this provision is shared by the departments and laboratories.

Establishment of Awards and Other Incentives Programs

On my fourth point: the technology transfer legislation, reinforced by the executive order, called on departments to establish incentives to laboratory scientists, engineers, and technical staff to encourage them to share their innovations. Such incentives could include providing (1) awards for inventions or contributions to technology transfer, (2) a share in the profits made on inventions, and (3) personnel exchange programs.

Awards Program

As I mentioned earlier, we found that most of the departments had not complied with this legislative provision to establish a distinct awards program for technology transfer activities. Only three out of the 10 departments we contacted, reported having such a program.

Some of the laboratories, however, have taken the initiative to establish other types of awards programs, independent of their department headquarters. Some have also nominated staff for the "Special Awards for Excellence in Technology Transfer" presented annually by the Federal Laboratory Consortium for Technology Transfer (FLC).

Laboratory awards are granted to inventors, noninventors who contributed toward a patent, and others who have assisted in transferring technology. Seventy-two percent of the laboratories that grant such awards reported that they were established because of an early interest in and support for technology transfer, not in response to the act. The FLC awards are given competitively for excellence in transferring specific technologies from federal laboratories.

Once again, the departments seem to have missed the opportunity to show the laboratories their commitment to both the letter and the spirit of the technology transfer legislation.

Royalty Sharing

With regard to royalties, as you know, before 1986, all royalties earned on inventions derived from federally supported R&D were paid to the U.S. Treasury. The Congress intended to provide a major incentive for technology transfer activities for federal laboratories and scientists by mandating in the 1986 legislation that a department pay its inventors at least 15 percent of the royalties derived from their inventions, if the invention was produced using agency resources. The remainder of the royalties are to be distributed among the department's laboratories.

We found that among our respondents, royalty-sharing programs had been established in slightly less than one-half of the laboratories, and royalty payments of nearly $800,000 were distributed to 313 inventors in 1989. The efforts of those laboratories that have established royalty-sharing programs are laudable achievements and have provided additional resources to promote technology transfer. Equally important is the incentive royalties give other scientists to pursue technology transfer activities. If the remaining 56 percent of the laboratories were to implement the provisions, these incentives could be significantly increased.

Personnel Exchanges

The technology transfer legislation and the executive order emphasized personnel exchanges as an important mechanism to foster technology transfer. The intent of the legislation was to have federal laboratory scientists spend time in universities, industry, nonprofit organizations, state and local governments, and foreign institutions, and also to have representatives from these same organizations spend time in federal laboratories for the purpose of technology transfer.

Personnel exchange programs have been instituted in 76 percent of the laboratories, and in 1989, slightly more than 14,000 scientists and engineers had participated in the program. However, these programs are primarily a one-way exchange: 88 percent of them consist of nonfederal scientists visiting federal laboratories. And of that 88 percent, about 70 percent were visiting scientists from U.S. academic institutions and industries. Visiting scientists from foreign countries represented 22 percent of the exchanges.

Our findings indicate that only half the legislative intent of this program is being met. What has resulted is effectively a "visiting scholars program" as opposed to a balanced exchange. The exchange programs seem to have achieved only limited success as an incentive to federal laboratory personnel.

CONCLUDING COMMENTS

In conclusion, our survey has shown that the level of implementation of the technology transfer legislation has been uneven across the federal departments and varies by legislative or executive order provision. We believe that the fact that nearly one-third of the laboratories had not received implementing instructions from their parent departments and slightly more than one-half of the laboratory directors had not been delegated authority to enter into CRDAs are significant contributory factors to the uneven level of implementation we found.

There have been, however, some notable successes and useful lessons learned. A cadre of dedicated and competent professionals is now working in many laboratory ORTAs to foster technology transfer. More private firms and universities have formed cooperative research and development agreements and established other links to the federal laboratories. And overall, more federal laboratories and their personnel are actively involved in technology transfer activities and are being rewarded for their efforts. There has not been a large increase in the number of patents, licenses, and new technologies from the federal laboratories to the commercial sectors; however, where implementation of the legislation has occurred, it has been relatively effective.

A continuing, concerted commitment to both the substance and the spirit of the technology transfer legislation by the parent departments of federal laboratories is needed for full implementation. Additionally, a comprehensive education and outreach effort will be a necessary, though not a sufficient, step to address the real or perceived barriers to technology transfer that remain. The Congress and the executive branch will have to continue to monitor the level of implementation through congressional oversight activities and the federal reporting requirements of the legislation.

The information that we have collected on implementation is necessary as a beginning step in examining the overall impact of technology transfer, but it does not, of course, assess that impact. It is important to have full implementation of the legislation before such a comprehensive evaluation of effectiveness can be undertaken. This is especially important in a case where the life cycle of the program's output includes the movement of ideas to the level of innovations and the subsequent movement of innovations to the commercialization of products. We believe it would take at least another year or so before an impact evaluation could be started.

Mr. Chairman, this concludes my opening statement. I would be happy to answer any questions you or other members of the Committee may have.

RELATED GAO PRODUCTS

Federal Agencies' Actions to Implement Section 11 of the Stevenson-Wydler Technology Innovation Act of 1980 (GAO/RCED-84-60, Aug. 24, 1984).

Technology Transfer: Constraints Perceived by Federal Laboratory and Agency Officials (GAO/RCED-88-116BR, Mar. 4, 1988).

Technology Transfer: Implementation Status of the Federal Technology Transfer Act of 1986 (GAO-RCED-89-154, May 30, 1989).

"Implementation Status of the Federal Technology Transfer Act of 1986" (GAO/T-RCED-89-47). Testimony before the Subcommittee on Science, Research, and Technology, Committee on Science, Space, and Technology, House of Representatives, June 1, 1989.

"Implementation of the Technology Transfer Act: A Preliminary Assessment" (GAO/T-PEMD-90-4). Testimony before the Subcommittee on Science, Research, and Technology, Committee on Science, Space, and Technology, House of Representatives, May 3, 1990.

Technology Transfer: Federal Agencies' Patent Licensing Activities (GAO/RCED-91-80, Apr. 3, 1991).

STUDY POPULATION

	Laboratories	
Department	Number	Percent[a]
National Aeronautics and Space Administration	9	3
Environmental Protection Agency	13	4
Department of Agriculture	59	20
Agricultural Research Service (48)		
Forest Service (11)		
Department of Commerce	27	9
National Institute of Standards (4)		
National Oceanic and Atmospheric Administration (22)		
National Telecommunications and Information Administration (1)		
Department of Defense	69	23
Department of the Army (41)		
Department of the Air Force (11)		
Department of the Navy (17)		
Department of Energy	18	6
Conservation and Renewable Energy (1)		
Defense Programs (4)		
Energy Research (11)		
Fossil Energy (2)		
Department of Health and Human Services	24	8
Alcohol, Drub Abuse, and Mental Health (3)		
Centers for Disease Control (3)		
Food and Drug Administration (6)		
National Institutes for Health (12)		
Department of Interior	28	9
Bureau of Mines (9)		
Bureau of Reclamation (1)		
U.S. Geological Survey (5)		
Fish and Wildlife Service (13)		

Department	Laboratories Number	Laboratories Percent[a]
Department of Transportation	3	1
U.S. Coast Guard (1) Federal Aviation Administration (1) Federal Highway Administration (1)		
Department of Veterans Affairs	47	16
Veterans Health Services and Research Administration (47)		
Total	297	100%

[a] Percents do not total 100 due to rounding.

Mr. **Thornton**. Thank you very much, Mr. Chan.

We will go ahead and hear from our second witness, Mr. Kuper, who has been previously introduced, and then open for questions to the panel.

Mr. Kuper.

Mr. **Kuper**. Thank you, Mr. Chairman. Thank you to you and Congressman Henry for this opportunity to help inform this committee's leadership in a critical area in America's competitive future.

By way of caveat, I should say that I am discussing manufacturing process technology. My orientation is a manufacturing one—that is, always looking for a better way to transform material—rather than some of the other kinds of research outputs that really change the kinds of materials we have available to us to use, and that we may have different animals here. I am talking about the manufacturing animal specifically.

By way of background, it is quite obvious to the rest of the world, in fact, the United States is the envy of the rest of the world, because we know how to manage research. What we do not know is how to manage its transition into technology. In fact, some educators say we don't know how to manage technology itself. So we are clearly plowing new ground in this particular series of legislative and intellectual interests for America.

From our experience, our belief is that current approaches that we have embarked upon correctly rely on what we would call the invisible hand of the market, but they don't yet deal with user needs that we believe are critical to driving effective technology transfer programs.

The programs currently in place and the incentives they provide, including the CRADA's and ORTA's, will not, we believe, make laboratory personnel aware of manufacturing process technology needs nor, indeed, make them sufficiently interested in becoming aware of those needs.

Similarly, research laboratory output typically is too early in its life cycle for potential commercializers to visualize product implications from the results of that research. CRADA's, I think, will help in bridging that gap, but there is still a gap in developmental research that would overcome that particular problem.

A third function that we are concerned about is the demand function. The users' needs themselves are not naturally articulated. There is no natural mechanism for manufacturers to come forward and say, "We need to have a better way of joining materials," or, "We need to have a better way of linking operations together with electronic data." And, similarly, those user needs must be conveyed directly to the researcher.

One of my associates, Dr. Tanatski, is fond of saying, "This is a body contact sport." It is labor intensive. But to get the researcher knowledgeable enough about the needs of the manufacturing base we believe is critical to the kind of connectivity that we are trying to achieve.

That also speaks to the GAO's report, which says essentially we have on our hands a cultural issue, and the question becomes one of, what are the cultural levers we should be looking forward to trying to identify and to pull to create the kinds of incentives we want to have?

In our small project, we have done several interesting things. The first thing we have done is we have tried, in very rudimentary fashion, to establish a set of manufacturing needs in terms that the researcher finds useful so that the researcher, her or himself, does not have to go out into a factory and experience those problems first-hand, because that is pretty inefficient.

But we sit down with the researcher after they have a chance to look through the statement of problems, and, with people who have an understanding of the real need, interact with the researchers directly. Something happens then; an "ahah" occurs; and the researchers come forward with interesting ideas. In the three laboratories we have worked with, over 60 ideas popped out of that original "ahah."

Now what we have done—well, I should say also, about those 60 ideas that came forward, 30 percent of them were what we call new gold. They were ideas that had been developed in the laboratory but had been put on the shelf or in the researcher's head and not viewed to be important enough to even bother filing a disclosure statement. No patenting, no intellectual property protection, because there was no understanding of the relevance of that intellectual development to the problem.

Now what we do in the next step of our pilot is to essentially vet or do a triage on those proposals, because some of them are interesting but not particularly useful or they are too premature, they are not developed sufficiently, and we have been able to come up with what we call mini-business plans for about nine or ten of those 60-plus technologies that were originally identified. We then go and find—and put together commercialization plans, and we will do some prototype development as well to try and make that bridge between the researcher's concept and the user application which I mentioned earlier as being lacking.

Now this is a small project. We have learned a lot in that project. We are not sure quite just what it is we have learned. We have had experience, but we are not able to codify it yet, which frustrates us since we are merely 100 people, or 110 people, and for us to be effective we have got to capture this in some methodology, some kind of tool that we can get others using in a similar fashion.

But if I had to summarize what I think the major issues are, I would say that incremental or new dollars is probably not the issue. What is the issue is a better statement of needs, more focus on understanding the needs.

A second issue is methods by which value can be added to the ideas that the researcher has, developmental activities, pre-commercial development, and here I may have to sort of back up on my earlier statement; there may be need for resources in this territory, because when we look for those resources we find them very hard to uncover and identify because they are pre-commercial; the commercial sources are not available and they are post-research, which means the Government, traditional Government, sources are not available.

The third issue is that we clearly have to have more contact with individual researchers in laboratories themselves. Telling the administrators is important; getting the systems in place, the mechanisms in place, is critical; but even more critical is contact directly with the researchers themselves.

I was thinking, Mr. Chairman, about your opening remarks and your desire for a Marshall Plan for our national economy. I was trying to think of how to relate our experience, our small ITI experience, to your desire. We have 18—a dozen and a half or so—intellectual property agreements now in the marketplace. They represent a lifetime value of maybe between five and six million dollars. They are generating an annual return to the Institute of half a million dollars. More importantly, of course, it means that somebody is out there selling the stuff and making it useful to a broader community. It is really increasing the applications not just the dollar revenue.

But our return on that research has been effectively slightly over 3 percent. Now if you take that $60 billion of investment that the Federal laboratories—the Federal R&D investment, engage in some voodoo business planning, you can say that we should be looking at something like $1.8 billion in intellectual property return out of our Federal investment.

Now I believe, of course, that $1.8 billion can be well cycled back into this national treasury we have, this phenomenal research base that we have, for supporting our future industrial American competitiveness.

Thank you very much, Mr. Chairman.

[The prepared statement of Mr. Kuper follows:]

A NEW APPROACH TO TECHNOLOGY TRANSFER IN THE FEDERAL LABORATORY SYSTEM[1]

By George H. Kuper
Industrial Technology Institute[2]

Testimony delivered to the Technology and Competitiveness Subcommittee, Committee on Science, Space, and Technology, U.S. House of Representatives, May 30, 1991

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[1] This testimony draws on ITI experience led by Louis G. Tornatzky and Richard H. Shackson. A paper expanding on this discussion will be presented at the annual meeting of the Technology Transfer Society, in June, 1991.

[2] George H. Kuper is President of the Industrial Technology Institute, in Ann Arbor, Michigan. Prior to joining the Institute, Mr. Kuper was Director of the Manufacturing Studies Board of the National Research Council in Washington, D.C. He has long experience in industry and government.

Introduction

Mr. Chairman, it is a pleasure to be here today and contribute in some small way to the important deliberations in which this Subcommittee is involved. The experience of the Industrial Technology Institute has been extensive in the field of technology transfer as it specifically applies to manufacturing processes. In that specific domain, potential opportunities for commercially viable applications of technology are imbedded in complicated manufacturing systems that are very remote from the laboratory researcher. Rather than forcing the researcher into that "foreign territory", we have developed a market based approach that informs the research community of manufacturing problems and extracts and tests ideas for possible application. Your support has given us a valuable opportunity to test our approach and it works. I would like to convey today a summary of the lessons that we have learned from that experience. My objectives in this morning's testimony are:

- To frame our view of the nature of the technology transfer problem confronting the Subcommitee and the country;
- To briefly describe our experience in addressing that problem, which we have gained through a pilot project which we have been running for the past 18 months;
- To identify some unmet needs that hamper more effective technology transfer activities in the Federal Labs.
- To respond from our perspective to the specific questions raised by the Subcommittee regarding the implementation of the Federal Technology Transfer Act.

Before I address these specific objectives, it would be useful to provide the Subcommittee with some background information.

The problem of transfering research-based technologies: What is it?

It is important to get some historical perspective on the nature of the "technology transfer problem", otherwise we will continue to solve yesterday's dilemmas. If we look back ten years to 1981, we were just entering an era of significant concern about how to transition research-based technologies, accompanied by a renewed energy level to solve those issues. The thinking of that era is instructive (1). To summarize the then-prevailing wisdom, three categories of "obstacles" were seen as impeding better transfer of research-based technologies to commercial practice:

- Issues of macro-level policy, law, and regulation. For all practical purposes, as we entered the 1980s, federally-funded research conducted in our national laboratories was held captive in a thicket of regulation and law, particularly concerning issues of intellectual property, cooperative research, licensing, and researcher participation in commercialization processes.

- Organizational and inter-organizational structures. Law and regulation notwithstanding, we also entered the 1980s with a very limited body of social engineering knowledge on how to bridge the gap between research-performing institutions and industrial clients and partners. There were few established models for cooperative research arrangements, or accepted structures to work with industry on proprietary projects.

- Two cultures. There was also great disparity between the values and epistomological perspectives of researchers in labs, and their technical counterparts in industry. These included different views of the research agenda, different concepts on what were appropriate professional goals and behaviors, and very different viewpoints on expectations, schedules, and the concept of "deliverables".

We would make the argument that the country has made great progress over the past ten years in solving the first two problems, but limited success in addressing the third.

In the area of underlying law, regulation, and policy there has been, frankly, a sea change over the past ten years, much of which has originated in this body. I will not recite the legislative history that began with Stevenson-Wydler and Bayh-Dole, and is still being fine-tuned, other than to make the argument that for all practical purposes the legislative agenda is appropriate to our experience to date. There have been parallel activities at the level of the labs themselves. Virtually every major research-performing institution in the United States has changed its internal policies on issues of intellectual property, participation of researchers in commercialization activities, and the internal regulations that pertain thereto (2).

We also have made significant accomplishments in the invention of inter-organizational structures (3) and in building fairly elaborate transfer organizations and programs in at least the first tier of Federal laboratories. This is not to imply that more creative thinking is not needed. For example, one of the more important tasks that laboratories need to address is how to position themselves more effectively in their regional and sub-regional economic settings (4). That of course, implies that labs need to become much more knowledgeable about the structure and functioning of economic and industrial structures than they have in the past.

Despite all these changes and reforms, there is still great disparity across research-performing institutions, and researchers themselves, on the ability and willingness to engage in technology transfer and commercialization activities. Many of us are aware of the significant technology transfer accomplishments being made at places like Oak Ridge, Brookhaven and Sandia, but there are other laboratories which are doing very little.

It is also relatively apparent that the most important ingredient in successful lab-industry relationships are the lab researchers themselves, and the interpersonal relationships that they establish with their peers in industry. A recent survey reported by David Roessner and Alden Bean (5) pointed to the importance of person-to-person contact and informal communication linkages between labs and industry in order to achieve success in knowledge transfer.

Significantly, this type of researcher behavior is largely a function of the **organizational culture** that exists in the laboratory research section. If members of that culture value this type of external interaction, and are understanding of the appropriate behaviors that pertain thereto, then successful interation and collaboration might occur. As this Subcommittee realizes, one does not change "organizational culture" and values by legislative action or by agency or laboratory structures or directives alone. We must also change the views and behaviors of researchers by working with them as they focus more on the needs of industry.

These are the type of conclusions which led to the pilot project activity which I would like to describe today. This work is premised on the need to educate and in a sense "re-socialize" researchers labs, and in effect begin to change the culture in which they work.

The Federal Laboratory/ITI Projects

Over the past 18 months the Industrial Technology Institute has been involved in two major projects, one funded by the DOE through funding specifically appropriated for this purpose by the 101st Congress and one by NIST, which in the aggregate will amount to four person years of effort. The common theme of this activity is to bring a needs-driven perspective to the processes of technology transfer in client laboratories. An assumption in designing the project was that many lab researchers are not familiar with the multi-level problems experienced in environments such as durable goods manufacturing. An additional assumption was that it is also inappropriate for a researcher to personally invest the amount of time necessary to learn about the problems of individual manufacturers. ITI, as a research, development, consulting, and problem-solving organization that operates exclusively in that arena, has a wealth of experience as well as research data on those technology needs. We recognize also that a transfer is not complete until the technology is available to users in the form of a vendor-supported product, and we understand the market forces that influence this commercialization process. The goal of the project was to bring our research and practice-based understanding of manufacturing needs to the attention of laboratory researchers and research managers, and use that needs understanding as a basis for identifying opportunities for technology transfer and commercialization. The steps which we took in the project include the following:

1. Over a period of six months, we aggregated every item of published literature, and as much of the unpublished literature as we could lay our hands on, that pertained to technology trends and needs across 10 two digit SIC code durable goods manufacturing industries. In addition, this aggregate needs statement incorporated much of the ongoing problem-solving practice in the Institute, which includes engagements with nearly a thousand manufacturing companies over a seven year period. The product or deliverable from this part of the project was a 250+ page book, loosely organized in terms of 10 durable goods industries, six manufacturing functions, with appendices defining common manufacturing processes, as well as an annotated bibliography of sources. The purpose of the document is to try to capture in a fairly accessible manner the state of understanding of technology needs in this industry sector.

2. As part of our engagement with laboratories, this book becomes an opening wedge to a more active relationship with a group of researchers and research managers. Typically, we have tried to identify with lab management a group of 15-20 individuals who have both active research programs as well as an interest in a more ambitious program of technology transfer. Once these individuals are identified, they receive a copy of the manual in the mail, as a precursor to a 2-day visit. The first day of the visit involves an oral presentation and group discussion of the content of the manual. This involves lab personnel, as well as a group of 5-7 individuals from ITI staff, all of whom have extensive experience with manufacturing clients and problems. The intent is to raise the perceived importance of needs as the primary focus for identifying commercialization possibilities. By the end of the day a list of candidate technologies has begun to develop.

3. During the second day of our engagement a technology nomination process unfolds in which laboratory researchers meet one-on-one with ITI staff

members. Each team fills out one or more technology nomination forms, which identify plausible opportunities for transfer. During a typical lab visit, we may identify between 15 and 25 "candidate technologies".

4. The fourth step in the process involves a fairly structured screening of the nominated technologies back in our setting. This will involve the same ITI team, supplemented as needed by technical experts in areas in which we may be weak. The result is a narrowing down of the long list, to 2-4 technologies with significant potential for commercialization, on the basis of criteria such as prior art, protection, market potential, and the like.

5. For those technologies which then become selected, mini-business plans are developed for each. This involves analysis of prior art and market research on our part, the identification of potential commercialization partners, as well as an understanding of any needed advanced development prior to transfer.

6. Another often needed step is additional technology development. Many of the inventions that are nominated are in fact not sufficiently "hardened" to pique the interest of a potential partner. This is particularly so in durable goods manufacturing, when the logical partners for commercialization are equipment vendor companies, such as machine builders, who do not often have the opportunity to interact with research institutions and researchers.

7. The final step, of course, is the identification of a commercialization partner and the negotiation of a commercialization agreement. We have databases of potential commercializers, and have developed a disciplined approach for the search, qualification and negotiation process.

There are some important findings to report on our success thus far with this approach.

One important indicator of success is the extent to which our needs-driven approach is uncovering "new gold". That is, of the technologies that are nominated through our process, many seem to emerge because of our needs presentations and discussions. For example, of the 64 technologies which were nominated in engagements with our first three laboratories, roughly 30% were technologies which had heretofore not been in any transfer or commercialization path. That is, patenting activity was not being pursued, and in many cases an invention disclosure had not even been filed.

Of the "take" of technologies, four seemed to have high potential for commercialization as new manufacturing processes or systems. However, virtually all of them need some advance development or engineering prototype prior to marketing to a potential partner. We have selected one technology - in the general domain of measurement and instrumentation - which was developed at Argonne National Laboratory. We are devoting roughly a person year of engineering effort in collaboration with Argonne, to bring the technology to a hardened prototype version. We will then work with them to bring the technology to market. It should be noted that this particular technology was one that had not been identified in previous invention disclosures. Additional high-potential technologies which we found at other labs will be further developed as resources become available, including heat treating and welding process improvements and measuring systems.

Some Unmet Needs

Obviously, this project represents merely a blip on the horizon of needed change in the lab system. Nonetheless, our purpose today is not to portray our work as the end-all of resolving the "technology transfer problem", but perhaps to shift the agenda of our attention. Many of us have been talking about the disparate cultures of research and commerce for a long time. Perhaps, now is the time to devote our full attention to that long standing issue. Our pilot project represents a partial solution. We have tried to address an important aspect of cultural change: making researchers more aware of industrial needs external to their organization.

We have also learned some lessons in our pilot activity, and have identified some shortcomings in our approach, and in what the labs themselves are doing to transfer their technologies. These unmet needs are as follows:

1. A needs-driven approach should be brought to more labs, particularly facilities that are smaller than the "flagship" programs, and/or those which operate in the DoD domain. Many labs are doing very little transfer work, and they need to understand where to start.

2. The identification and aggregation of technology needs could use better methodology and disciplined inquiry. Much of the open literature on future technology needs is suspect and analytically weak. While divining the future of technology will never be an exact science, it could be significantly more systematic than the current art and practice.

3. There is a need for decision aids and management tools to make the process of technology transfer more cost-efficient. While transfer will always be a "body contact sport", with lots of scientist-to-scientist interaction, there is a need for decision software, better data bases, expert systems, and self-training tools to empower the practice.

4. A major limiting factor on the transfer of research-based technologies is the lack of money for advanced pre-proprietary development. In many cases, lab-based technologies are not sufficiently hardened to show to potential commercializers, and labs do not have such monies. Aside from the SBIR program, which is not a resource for many organizations, there are few sources of funds to support the creation of engineering prototypes of promising inventions.

These then are the opportunities for improving the transfer of technology from the labs system. Our position is fairly simple: we do not believe that major changes are necessary in underlying policy or legislation. The most important task is a far more difficult one: the time-consuming process of shifting the internal cultures of labs, and the behavior and perspectives of personnel who work there. There are also only a few ways to do that, and significant among them is the process of articulating industry needs and supporting commercializing activity, through various projects and structures, to a talented and fundamentally motivated lab workforce. ITI looks forward to our continuing role in this process.

I hope that my comments to the Subcommittee have been helpful. I appreciate this opportunity to advance them.

Response to the Subcommittees Points of Inquiry

Since I also promised that I would provide some comment on your agenda of issues and questions, let me do so at this time.

1. Are all agency and laboratory personnel aware of their responsibilities under the FTTA? Is there evidence that technology transfer efforts are being considered in promotions?

In our experience, most lab personnel are aware and supportive of the goals of FTTA, but understandably, have little experience in the operational aspects of how to do it. This includes limited awareness of the needs of industry, as well as a lack of knowledge about basic concepts of technology transfer (e.g., invention disclosures, protection strategies). We have no data on the promotional implications of FTTA.

2. What agencies and laboratories have successfully implemented the Act, and can their procedures for implementation be transferred to other agencies and laboratories?

Some labs are doing quite well, but we do not believe that the mere sharing of procedures will get the job done. Most labs have most of the necessary procedures and structures in place. Incorporation of the Act's objectives in the mission and beliefs of the labs, is what we're all seeking. However, labs differ significantly in their managerial committment, and supportive culture. These latter cannot be changed by edict.

3. What steps need to be taken in the Executive Branch to complete implementation of the Act, and when will these steps be taken? Has sufficient delegation to laboratories of authority to enter Cooperative Research and Development Agreements (CRADAs) occurred?

The evidence suggests there has been sufficient delegation of authority. People have made use of the CRADAs organizationally but it's too soon to assess any real impact. CRADAs have not, however, been focused on manufacturing technology processes.

We set up ITI because we felt a new mechanism was necessary to support technology transfer of manufacturing process technologies. Our track record to date suggests that is the case. We do not know if specific mechanisms like an ITI are necessary for other technology applications.

4. Can any conclusions be reached at this point regarding the usefulness of the CRADA authority and the royalty sharing provided under the Act?

These are needed and useful reforms. However, by themselves they do not address the issue of "harvesting" already-existing inventions and technologies from the labs. They also tilt the playing field in the direction of Fortune 1000 firms, who have the flexibility of resources and staffing to enter into such agreements. It is difficult for a smaller company or startup to "bet the company" on a CRADA.

5. What are the major roadblocks to transfer of technology from the federal laboratories, and do any of these problems have a legislative solution?

To a great extent, legislation has removed the structural roadblocks to transfer of technology from the federal laboratories. The remaining roadblocks--more subtle but equally important--are cultural. In the present culture, competent, highly-motivated researchers are focused on a scientific or mission objective, and are not aware of commercial implications of their work. The ORTA has the job of evaluating what the researchers "throw over the wall" in the form of invention disclosures, and attempting to find a need--the classical technology push situation. In order for the process to work well, the researcher must become comfortable with the notion that there are potential non-mission-related applications of his/her work, and must be made aware of the needs that exist in industry that might be addressed by this work. Activities like a pilot project, seminars by industry representatives, and liaisons with manufacturing technology firms are some of the approaches that might be pursued. I doubt, however, that legislation per se can impart this market orientation, although expansion of the resource base to do pre-commercial development would help. More extensive implementation of the royalty sharing provisions in the existing legislation would also provide incentives.

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Mr. THORNTON. Thank you very much, Mr. Kuper.

We are going to continue the hearing by making arrangements so that Members can make this vote and continue the hearing as we do so, and I would like to recognize Mr. Henry for his five minutes of questions and ask Ms. Horn if you would assume the chair. I will go record my vote and be back in time for you to make your vote, if that will be agreeable.

Mr. Henry.

Mr. HENRY. Thank you, Mr., and now Madam, Chairman.

Thank you, Mr. Kuper. I must say, I thoroughly enjoyed your presentation to the committee, because it gave me an opportunity to kind of catch up with what has happened at ITI in these last 18 months, and I think it helps the members of the committee and others who are here understand what the NIST technology transfer program is, in part, trying to achieve, and particularly in the area of manufacturing science.

I am a former academic, and Mr. Ritter—Dr. Ritter—who is also on the committee, of course, was an engineer and chaired the full committee—was he formerly an academic? He was an academic scientist. And I know, for example, that even in academia your physicists, your chemists, sometimes don't talk to the engineers in the engineering colleges. Even there in that kind of ivory tower environment, it is very hard to get those who deal with applications technology as a science to deal with the people who like to think they are doing pure science, and if that is true within a university structure, it is all the more true when you have a Federal lab or an academic research facility and the guy who is on a factory floor, be it a foreman or a worker or a shop steward or the fellow who, if it is a small firm, probably fell into it by inheriting it from his mom and dad, you know, if it is a chapter S corporation, or if it is a larger environment, we sometimes think that the ivory tower and the blue collar don't speak to each other, and the problem is, what we are trying to do is get them to speak to each other, and you have a clash of values, and I do think it is fascinating that both yourself and Mr. Chan mentioned this whole point of cultural clash.

Now I think we are past that culture clash. You can say that now, and back home, and most people understand what we mean. We are trying to link it so we can get that research there.

But what you have really tried to do is go then first to the floor of the shop. In your written testimony, you talk about digitizing, so you have some kind of reference, so you could collate all this data in terms of talking to the factory worker, the factory management, the engineers in a factory setting, saying, "What do you wish you could do?" or, "What would make it better if it were possible? Don't worry about whether it is possible. What would make it better if it were possible, easier, give you a better product, cut your cost?" and then going over to the lab fellows and showing them that wish list, and that is really what you are doing. You are taking wish lists into those laboratories.

But when you get into the lab, you are saying you are having a hard time, while you are making some progress, and I respect the progress. You were also saying something very similar to Mr. Chan's very hard—you may get the directors of a division of a lab, but it is very questionable how far down you are getting in that staff in terms of those researchers.

Mr. **Kuper**. Mr. Henry, actually we are doing a researcher-to-researcher project right now. That is the pilot project we have been operating with the three labs so far. We are going below the administrative level, and we are talking directly to researchers. When we sit down, we take three or four people with hands-on manufacturing experience and sit down with 30 to 40 senior researchers in the laboratories and get them thinking about those problems directly.

What I am trying to convey to the committee is that that kind of direct contact, although seemingly inefficient, seems to be the only way we know of making that cultural leap.

Mr. **Henry**. Are the lab managers, the lab directors, reluctant to give time to the researchers for you to present what you are trying to do, or are they really psychologically, in terms of management perspective from the labs, supportive of you? Are they saying, "Oh, sure. Yeah, we understand that. This is critical to our existence as well as yours"? Or are they reluctant and say, "This really is a distraction from our research"?

Mr. **Kuper**. Our experience is limited, but we have had full support from laboratory management in what we are trying to do. We will see whether or not we can persuade the laboratory managers to take their tight budgets and spend some money on commercialization activities. That is sort of when rubber will meet road in terms of cooperation in this particular priority.

Mr. **Henry**. I am always personally very skeptical at this kind of psychologicalese that kind of infuses our society in terms of personal interactions and all this kind of devious sociology, but I am wondering whether—do these lab fellows ever really get in real factories, and do the people who run these factories ever get in labs, and do we need a cultural exchange there?

Mr. **Kuper**. I have come full cycle on this issue. I used to be in industry, and I used to think it would be a wonderful thing if we could persuade researchers to use our laboratories—our factories as their laboratory. I have since decided that that is an absolutely idiotic thing to do, because researchers are researchers because they are good at research, not because they are good at repetitive—managing and controlling repetitive operations, it is a very different animal, and that we probably are not doing ourselves a service by spending too much time getting the researchers out on factory floors because factory problems are relatively unique at first blush, one factory to another, and it takes somebody with a fair amount of experience to recognize the generic nature of a problem that a specific factory is having.

Asking a researcher to get that level of experience, I think, is probably a potential damage to the goose, if you will, in the analogy of the goose and golden eggs.

Mr. **Henry**. So while there's two cultures, we have to get cross-cultural interaction and exchange without destroying either culture.

Mr. **Kuper**. Precisely.

Mr. **Henry**. The idea isn't trying to merge them.

Mr. **Kuper**. Precisely. Precisely, which is why we have mounted this program. We are an applied house in ITI. It is interesting that we have, as you would expect, the normal cadre of industrial, mechanical, electrical engineers. We also have computer and software scientists, but in equal number we have behavioral and social scientists, because the issue of moving these technologies—identifying them and moving them into factory floors is essentially an organizational and a behavioral kind of question.

One of the things we have developed is a device to assess the ability of an individual organization to absorb new technology, so that part of our demand function is, What can this particular kind of firm absorb today versus what should they be able to absorb three years from now? And that should be an increasing curve.

Mr. **Henry**. Are you in the least worried about continuity? I am not trying to speak in terms of vested interests of your center, but—what?—we have four or five now, but in terms of ensuring that this remains continuous is going to be very important, isn't it?

Mr. **Kuper**. My understanding of the NIST centers is that we are probably—that we are the only one involved in what I have described as a mining exercise for these intellectual properties in the research base at this time.

We hope that our work can be translated into tools and methods that can be used by the other centers and other organizations. As I said, the manufacturing territory is a big one. Our hopeful value added will be in packaging the approaches and making it easier for other people to do the same things that we have been doing.

Mr. **Henry**. In terms of your view of the long-range role for manufacturing technologies in this country, in America as an industrial manufacturing country, would you agree with my assessment that sometimes we rather too glibly say that the white-collar thinkers will be here and the manufacturer move to low-wage labor environments, be it Mexico, Thailand, as opposed to say that as manufacturing science becomes increasingly sophisticated, costs such as transportation begin to outweigh wage differentials?

Mr. **Kuper**. We have already seen examples of that position. The steel industry—our movement in America to mini-mills is a perfect example, where we have traded off transportation costs for technology and won that battle.

Mr. **Henry**. The reason I want to mention that is because I do have the good fortune of a rather exceptional situation, you know, in my local, where our manufacturing base is growing in an environment where everything is against it—snow belt, high unionization, and net favorable balance of trade with Japan in manufacturing. So it is there. It is a matter of being on the leading edge, I guess.

Mr. **Kuper**. Absolutely correct.

Mr. **Henry**. So we are not dealing with a "sayonara" industry.

Mr. **Kuper**. I sure hope not.

Mr. **Henry**. Thank you.

Thank you, Madam Chairman.

Ms. **Horn** [presiding]. Thank you, and I do think we are going to have to take a very short recess. I am sure Mr. Thornton would like you all to remain at the table, if you can. I am sure he has some questions, and I hope to have some, too, when I come back.

Thank you very much for your patience, and we will probably be back in less than 10 minutes.

Oh, he is here already.

Mr. THORNTON [presiding]. Let us continue in the interests of expediting the procedure.

I would like to pursue some questioning with Mr. Chan and Mr. Kuper.

Mr. Chan, I was interested in the rather high percentage of departments which have not yet delegated to laboratories the function of entering into CRADA agreements—56 percent. Is that correct?

Mr. CHAN. That is right.

Mr. THORNTON. Do those agencies which have not delegated sometimes find other ways of effectuating the Act? I am trying to get to a question of how much this impairs the accomplishment of the public policy involved.

Mr. CHAN. Well, Mr. Chairman, what we have found is that there is a high correlation between having the delegation authority to the labs' directors versus those without. We have CRADA's from both sides, but those with the delegation—that means having precise authority to go ahead and negotiate for these agreements—you have a higher number of CRADA's. So, in fact, it does make a difference, but that is not—you know, it doesn't stop it.

Mr. THORNTON. Okay.

Did you find any major roadblocks to the transfer of technology from the Federal laboratories? And, if so, would you comment on them and explore what solutions might be available.

Mr. CHAN. Well, in our report in appendix four we mention from those respondents numerous roadblocks that they presented. Let me just give you examples of those.

Aside from the normal financial concerns and procedural issues on who can do what and so on, they raised a whole lot of legal issues and concerns that you mentioned earlier in your statement. Some examples of conflict of interest in the laboratories with the staff and negotiations; copyright protections of software, and this H.R. 191 is trying to address; the Freedom of Information Act concerns; security information, about sharing security information with others; and the right to get patents. Those are clearly concerns that the people had expressed to us through the questionnaires.

Mr. THORNTON. With regard to the question that you related to earlier in that response, conflict of interest, are there instances that you know of where agencies charged with regulatory authority have found it possible to also be active in the dissemination of scientific information?

Mr. CHAN. Well, we have a few agencies here from our data base. For example, in the EPA we found that there were instances of eight CRADA's, and of which we found also in CDC—Centers for Disease Control—there were 17 CRADA's, general agreements, being made; the Food and Drug Administration, we found 14 of these incidences. So there were regulatory agencies where we found these kinds of agreements being done.

Mr. THORNTON. Did you find or could you determine whether there was an acceptance of the revision in public policy that accompanied the Wydler-Stevenson Act and subsequent legislation—namely, that the public policy of the Nation now is that the application of inventions and creativity should be encouraged wherever possible rather than restrained, or did you—were you able to make a judgment on that?

Mr. CHAN. It is difficult to judge exactly why the response rate is what we found, quite frankly, because we are, in our report that we presented to you, really looking for the implementation side. That means having a draft guidance to us is, you know—and we are talking about up to three years since the law was passed. It is hard to see why it took so long, okay? That is one side. So there is an internal culture that you have been talking about.

Mr. THORNTON. I am so pleased to hear you come forward with that, because it seems, and some witnesses will be telling us, I believe, that it requires an enthusiasm both within the agency and within the private sector to make these devices work. Were you able to observe that in any way in your report?

Mr. CHAN. As I mentioned before, we had numerous instances—I think we listed 169 cases—of success that people brought up, and some of them are very fascinating, and even in failures, they present us so-called unsuccessful attempts, lessons to be learned. So I think they are there, but they are very individualistic, as Mr. Kuper mentioned.

Mr. THORNTON. And, Mr. Kuper, this is moving toward the area of your testimony, and I would appreciate your comments on this general subject.

Mr. KUPER. Mr. Chairman, I think you summarized it perfectly by saying this is an issue of enthusiasm, and how we build enthusiasm is something that we understand in sports, and we had better understand it as well in technology transfer, and we are getting there, but I think that the problem lies in clearly identifying needs in a fashion which does not distort the environment in which the researcher is functioning, because you can only get enthusiasm within an environment in which you are comfortable. So building that enthusiasm, I believe, requires bridging in two ways: one, in terms of needs articulation; and, two, taking the researchers' ideas and moving it far enough along so that the commercializer can recognize it as part of their environment as well.

Mr. THORNTON. Wouldn't you think that central to that enthusiasm would be a sense, a policy sense, within the agency that it is truly a matter of importance, a goal of the agency to encourage the dissemination of information and to—that that is a central part of each agency, according to the national policy as established in this Act?

Mr. KUPER. My belief is that the research community in America understands it from an information transformation—an information broadcast point of view very well. We publish a lot; we go to lots of meetings; we have lots of seminars. But that is not where rubber meets road in this kind of issue. What we have got to do is move beyond the conversation about things and move into an interchange, a dialogue, and that is what we are trying to argue for.

Mr. THORNTON. I shall never forget Dr. Jacob Rabinow testifying before this committee a few years ago, saying that we had 20,000 publicly owned patents which could not be licensed, and they could be wrapped in a nice blue ribbon and used as a reward, but economically, according to Dr. Rabinow, they were a piece of junk, because a patent that is available equally to everyone is worth nothing to anyone.

Mr. KUPER. Absolutely correct, and when I said in my voodoo business planning, "I suggest that you take a target of some type to create a financial target for people managing research activities," I think that is one of the ways that you get the attention and build the interest in the research community. I mean we have had targets for research publications in academic institutions for years, although we never admitted it. We should be doing the same thing that our research facilities in terms of dollars that should be earned from intellectual property revenue.

Mr. THORNTON. Thank you very much.

Mr. Chan, with completion of this report, GAO has an extraordinary data base on which to draw future comparisons and to determine in the future how well this is working, how not only compliance, but what effectiveness is coming from it. Either at this hearing or submitted for the record, I would like to have your suggestions for how we could proceed to build from that data base into future understanding of this question. Would you like to comment?

Mr. CHAN. We would be happy to work with your staff and you as well as other members of the committee toward that end. Let us work together instead of saying it right now.

Mr. THORNTON. Very good.

I want to thank our witnesses for their excellent testimony, provocative and factual, and ask that you—if you will be willing to respond in writing to such questions as may be sent to you by other Members who are not present at this time or by staff.

Mr. CHAN. We will be happy to. Thank you.

Mr. KUPER. We'd be honored to do so. Thank you for this opportunity.

Mr. THORNTON. Thank you for your time and help.

We will now call the second panel, and I am going to exercise the prerogative of the chair and add to the second panel Ms. Cherri Langenfeld, who is the director of OTA. I didn't read far enough—Office of Technology Analysis, U.S. Department of Energy. And I understand that you have a plane to catch, and so we are going to move you into the thick of this next panel, and that will allow us to focus our efforts very strongly on the two remaining members of your panel.

Ms. LANGENFELD. Thank you very much.

Mr. THORNTON. Would the second panel please come forward?

I am very pleased to see the members of this second panel, because I have had the enjoyable experience of working with several members of this panel previously, and I am looking forward to your testimony and to continued opportunities of working with you.

The panel will include the Honorable Deborah Wince-Smith, who is the Assistant Secretary for Technology Policy of the United States Department of Commerce; Ms. Cherri Langenfeld, who is Director of, it is OTA—of the U.S. Department of Energy, even though it is the Office of Technology Analysis; Mr. Reid Adler, who is Director of the Office of Technology Transfer of NIH; and Ms.

Sharon Smith Holston, who is the Associate Commissioner for Management and Operations of the United States Food and Drug Administration, and she is accompanied by Dr. Ronald Hart, who is Director of the National Center for Toxicological Research, which is not located within my Congressional district, though if there were some way to redistrict to include the facility, I would be pleased to have the opportunity of working with you as your personal representative.

We are glad to have all of you here, and I am going to ask the witnesses again to recognize that your prepared statements have been received, there has been an opportunity to review them, and they will be entered into the record fully—word for word—just as though you read them aloud to us, and in the interests of time I would like each of you, in order, to summarize your testimony so that we may have an opportunity for some questions, and I will begin with the Honorable Deborah Wince-Smith.

STATEMENTS OF HON. DEBORAH L. WINCE-SMITH, ASSISTANT SECRETARY FOR TECHNOLOGY POLICY, U.S. DEPARTMENT OF COMMERCE, WASHINGTON, DC; CHERRI LANGENFELD, DIRECTOR, OFFICE OF TECHNOLOGY ANALYSIS, U.S. DEPARTMENT OF ENERGY, WASHINGTON, DC; REID ADLER, DIRECTOR, OFFICE OF TECHNOLOGY TRANSFER, NATIONAL INSTITUTES OF HEALTH, BETHESDA, MD, AND SHARON SMITH HOLSTON, ASSOCIATE COMMISSIONER FOR MANAGEMENT AND OPERATIONS, U.S. FOOD AND DRUG ADMINISTRATION, ROCKVILLE, MD, ACCOMPANIED BY RONALD W. HART, DIRECTOR, NATIONAL CENTER FOR TOXICOLOGICAL RESEARCH

Ms. WINCE-SMITH. Thank you, Mr. Chairman, members of the subcommittee.

I am delighted to be here this morning to discuss the progress in implementing the Federal Technology Transfer Act against a backdrop of rapid technological change and unprecedented international competition. This Act plays an increasingly important role in enabling the United States to take full advantage of our scientific and technological assets.

The Federal laboratory systems, facilities, personnel, and technologies have never been more accessible to U.S. industry, and every day we are witnessing new opportunities for our private sector to derive tangible commercial benefits from engaging in our Federal R&D activities.

We in the Commerce Department are pleased that the GAO report reported no fundamental flaws in the legislative foundation for, and the current approach to, current Federal technology transfer. While we question some of the data presented in the GAO's report, primarily due to the fact that the report completed its survey at end of 1989, we do recognize that the report identifies a number of wrinkles that need to be ironed out in implementing the Act, and it made some very important recommendations in the areas of technical data, software protection, and the need for additional legal resources in Federal laboratories.

I might add here that, vis-a-vis the Department of Commerce's technology transfer activities, we are very pleased that we had established ORTA's before the Act was even passed and that our delegations have been in place for some time, and, very importantly, last October Secretary Mosbacher issued a memo to the entire Department making Federal technology transfer a primary goal and mission of the Department of Commerce.

Since the inception of 1986 Act, our Federal agencies have worked very hard to make tech transfer and commercialization by the private sector an integral part of their functions. Clearly, as a result, more Federal technologies are being patented and licensed, royalty income has increased, invention disclosures are way up, and, most importantly, there has been a dramatic increase in the number of cooperative R&D agreements concluded between Federal laboratories and U.S. industry, and, again, to underscore the significance of this and how we are just now seeing the real pay-off from the Federal Technology Transfer Act in the Department of Commerce. At the end of 1988, before the data was in that is reflected in the GAO questionnaire, we only had nine CRADA's. At the end of 1990, we have 81. So I think this underscores how, in the last two years, we are seeing a dramatic rise in this activity as the Act's authorities are fully implemented in our facilities.

The technology management principles and regulations embodied in the Act are also beginning to transform the culture within our Federal laboratories, and this is a very important issue as we heard in the earlier panel. The culture is now encouraging Federal scientists and engineers to explore, wherever appropriate, the commercial potential of the technologies they develop to fulfill their mission responsibilities. This framework is what is encouraging the new alliances between industry and Federal labs.

Now I think we have to recognize that there are limits to the contributions Federal laboratories can make to U.S. industrial competitiveness. Our Federal laboratories have been established to fulfill statutory missions, and Federal research can complement, but it can never substitute, for the market-driven R&D efforts of a dynamic private sector. Even granting these limitations and a built-in tech transfer gap, we can and must do a better job of making our incredible Federal R&D resources accessible to the private sector to create world-class products and services.

Let me briefly mention that we must again recognize that the barriers to success of such collaborative partnerships are, in many cases, cultural in nature and they are difficult to overcome, and, again, we have to recognize that the time-consuming transfer gap when Federal technology is spun off to industry occurs because the two systems are fundamentally different in their objectives and purposes, but if we don't narrow that gap, what we fear in Commerce is that Federal technologies with multi-application commercial potential may be trapped in mission applications and never reach the market before the technologies become obsolete, or before they are utilized by our foreign competitors.

There is a lot to be done, and the Commerce Department will soon be issuing—Secretary Mosbacher will soon be issuing our second biennial report on Federal technology transfer which will contain some specific recommendations to guide our efforts in the future.

One of the things that we think in Commerce that needs to be done in accelerated fashion is for our Federal agencies at the highest level to make the adoption of technology transfer and commercialization by the private sector an explicit mission goal. And I mentioned that Secretary Mosbacher did this last October in a memo that was issued throughout our Department. Moreover, the importance of Federal technology transfer and management must be reflected in the position descriptions and performance plans of our Federal laboratory employees.

Incentive systems within the labs should reward research personnel who take the initiative to reach out to establish alliances as appropriate to their mission with U.S. industry, and, in parallel, Federal labs technology transfer and commercialization functions should be fully integrated into labs' administrative structure and not be buried or placed off line down in the organization which indicates a low priority for the function. And another key area that we have heard this morning is, we need to work very hard to bring industry in early on into the actual R&D activities so that our firms are aware of what is going on in these labs and can see the potential of many multi applications underway.

If we do not involve industry up front, rather than as an afterthought when the R&D is completed, we will not make any progress on bridging the technology transfer gap I have referred to. And, of course, another word for this process that we are all familiar with in the technology world is concurrent engineering. We need to bring our industrial people in very, very early in the process.

One way to do that, that we could make progress on, is the establishment of actual exchange programs between our industrial sector and our Federal labs, and a number of departments and labs are doing this. We have very active programs at our National Institute of Standards and Technology, where we have had an industrial liaison visiting program for many years. And I am very pleased to say that the Jet Propulsion Laboratory Center for Space Microelectronics, which is a very significant advanced facility in the space arena, has just now established a new exchange program with industry as well, and that is something that we should pursue aggressively.

I would like to finally mention that the Interagency Committee for Federal Technology Transfer which I chair is addressing a number of policy issues and other problems confronting the agencies as they implement the Federal Technology Transfer Act. And we are very pleased that this committee has been recognized by the White House's Council on Competitiveness's new Committee on Commercializing Government Research as the key vehicle for sending up to the White House recommendations for new activities and initiatives in this area.

Finally, I would like to mention that we are continuing our outreach efforts with industry to showcase science and technology assets in our Federal labs. This fall, we are going to be hosting a very high level conference with our private sector on the ongoing research in our Federal labs in the area of environmental technology. We have coupled this with a trade session that will deal on the second day of the conference with the export opportunities to Eastern Europe.

I would again, in closing, like to recognize the tremendous support we have received from you, Mr. Chairman, and Congresswoman Morella for introducing the computer software bill, which is a very, very significant thing that we hope will be concluded shortly.

I might add here that we all know that software is one of the most strategic technology assets we have in the United States. It underpins virtually every R&D activity, and there is no question that allowing commercially viable software to be thrown into the open domain and picked up by our foreign competitors—who have targeted this as one of their key acquisition efforts—is not in our national interests.

Thank you. I will be pleased to answer any questions.

[The prepared statement of Ms. Wince-Smith follows:]

STATEMENT OF
DEBORAH L. WINCE-SMITH
ASSISTANT SECRETARY OF COMMERCE FOR TECHNOLOGY POLICY
BEFORE THE
SUBCOMMITTEE ON TECHNOLOGY AND COMPETITIVENESS
HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
MAY 30, 1991

Mr. Chairman and members of the Subcommittee, I am pleased to be here today to discuss the progress in implementing the provisions of the Federal Technology Transfer Act. Against a backdrop of rapid technological change and unprecedented international competition, this Act plays an important role in enabling the United States to take full advantage of its scientific and technical resources.

For over a decade, the Congress and the Executive Branch have worked together in removing barriers to and providing incentives for the commercial use of Federal R&D. Your leadership and cooperation in this important endeavor have made it possible for us to accomplish many improvements in the management of Federal technology. Continued cooperation will help this nation reap the full competitive and economic benefits our public R&D investments can deliver.

The Federal laboratory system's unique facilities, personnel, and technologies have never been more accessible to U.S. industry, which has created many new opportunities for the private sector to derive commercial benefits from Federal R&D. Of course, there are limits to the contributions Federal laboratories can make to U.S. competitiveness. They must first fulfill the missions of their agencies which are not and cannot be dictated by market considerations. Thus, Federal research can complement but never substitute for the R&D efforts of the private sector. However, even granting these limitations, we can and must do a better job of making Federal R&D accessible to the private sector to convert into products and services that are competitive in the global marketplace.

In assessing the impact of the Federal Technology Transfer Act, our attention is drawn to tangible measures of success--the numbers of patents, invention disclosures, cooperative research and development agreements, and the like. However, other important benefits cannot be measured so easily. For example, these technology management authorities are beginning to transform the culture within our Federal laboratories by encouraging Federal scientists and engineers to explore, where appropriate, the possible commercial potential of the technologies they develop. The authorities also encourage ongoing alliances between industry and Federal laboratories which contribute to bringing Federal research results to the marketplace in a competitive time frame.

It is gratifying to note that the General Accounting Office reported no fundamental flaws in the legislative foundation for, and the current approach to, Federal technology transfer. While we question some of the data presented in GAO's report, it does identify the wrinkles that must be ironed out in implementing the Federal Technology Transfer Act. Federal technology transfer efforts will take time to come to full flower. An implementation learning-curve, adjustments, and some difficulties can be expected when such a major shift in Federal policy occurs. The experience of university research centers in promoting the commercialization of their R&D results suggests that it takes a substantial period of time, perhaps as much as ten years, to establish an efficient and effective process that will bear fruit in the form of new or improved commercial products and processes.

As all of you know, the Department of Commerce plays an important role in coordinating the government's efforts to encourage commercial use of Federal R&D by the private sector. The principal vehicle for these activities is the Interagency Committee for Federal Laboratory Technology Transfer which was established in 1987 by former Commerce Secretary Baldrige and is comprised of Assistant Secretary-level representatives from all Federal agencies and departments involved in R&D.

The Committee, which I now chair, addresses issues confronting the departments and agencies in implementing the Federal Technology Transfer Act and it also contributes to the development of policies involving broader technology transfer issues. The Committee's efforts are supported by a working group of senior personnel from each agency and department represented on the Committee.

Our Interagency Committee is now closely linked to the Working Group on Commercialization of Government Research, which the President recently established within the White House's Council on Competitiveness. This allows for the Committee to bring major problems and policy issues affecting the efficient and effective transfer of Federal R&D to the attention of the Council for consideration and resolution.

For example, our Interagency Committee has addressed two important issues now before the Council's Working Group--the application of the Freedom of Information Act (FOIA) to cooperative research and development activities and conflict of interest issues. The FOIA has the potential to reduce the incentives for industry to collaborate with Federal partners in R&D. On behalf of the Council's Working Group, our Committee is now considering conflict of interest issues to ensure that our efforts to increase interactions between Federal scientists and engineers and the private sector are consistent with high ethical standards.

In the more than four years since the Federal Technology Transfer Act was passed, Federal departments and agencies have worked hard to make technology transfer to, and commercialization by, the private sector an integral part of their laboratory functions and, most importantly, a priority mission. For example, Secretary Watkins has personally endorsed the transfer and commercialization of Federal R&D as a top Energy Department goal. The Department's laboratory directors and technology transfer personnel have responded to his leadership with concerted efforts to accomplish this goal.

At the Department of Health and Human Services, the National Institutes of Health (NIH) have created what appears to be a highly effective program for the transfer and commercialization of research and are among the leaders in forming cooperative research and development agreements with industry. With strong leadership and commitment from its Director, NIH accomplished this by bringing in professionals who are experienced in technology licensing, venture capital, and biotechnology to support NIH technology management activities.

Tangible measures indicate that the Federal agencies and departments have made solid progress in implementing the Federal Technology Transfer Act. The number of inventions disclosed by Federal laboratories has increased by 68 percent in the three years since FY 1987, with 3,619 disclosures in FY 1990 alone. While the number of patent licenses granted has only increased modestly since 1987, the percentage of licenses requiring royalty payments has increased from less than half in the early 1980s to 95 percent in FY 1990. In FY 1990, the Federal government collected $9.4 million dollars in royalty revenues from licenses. As an indicator of increased efforts to encourage the private sector to commercialize Federal R&D, exclusive licenses granted increased from only 6 percent of all licenses in FY 1981 to 41 percent in FY 1990.

At the Department of Energy laboratories, an average of 19 licenses per year were granted before contractor operators were able to retain title to and license inventions they develop. Since FY 1987, Energy Department laboratories have issued an average of 62 licenses per year, with 88 licenses issued in FY 1990 by contractor-operated laboratories, which are now able to retain title to and license inventions they develop.

There has also been a sharp increase in the number of active cooperative research and development agreements between Federal agencies and departments and the private sector--from 33 in FY 1987 to more than 450 in FY 1990. This demonstrates dramatic progress in getting industry to take advantage of the unique capabilities within our Federal laboratories. I believe such cooperation is the critical ingredient for success in achieving the goals set forth in the Federal technology management authorities.

Let me share with you an example of the economic potential of government-industry cooperation under the Federal Technology Transfer Act. The City of Oak Ridge, Tennessee, site of the Department of Energy's Oak Ridge National Laboratory, has begun to reap the benefits of increased technology transfer activities at that laboratory. Companies like Coors have located facilities in Oak Ridge in order to be near the laboratory, which strengthens the local economy. In addition, Moody's bond rating service recently upgraded its ratings of bonds issued by the city. According to press reports, the improved rating was tied in part to the local economic benefits that flow from technology transfer and commercialization activities at the laboratory.

Much work remains to be done in fully implementing the Federal Technology Transfer Act. While the legal framework is now in place for industry-government collaboration in R&D, there are still barriers to the success of such activities, many of which are "cultural" in nature. I believe attitudes both within the Federal laboratories and in industry must change if we are to derive maximum benefit from our Federal R&D investments.

Our Interagency Committee is now focusing on these issues and the Commerce Department's second biennial report on Federal technology transfer, which will be submitted by Secretary Mosbacher later this year, will contain a number of recommendations to guide our work in the future.

One of the most important steps that Federal departments and agencies can take is adopting technology transfer to, and commercialization by, the private sector as a goal in each

Federal laboratory's mission. The importance of Federal technology management activities must be reflected in the position descriptions and performance plans of laboratory employees, from the director to individual scientists and engineers. Incentive systems should reward laboratory personnel who reach out to establish alliances with industry for commercializing Federal R&D. Technology transfer and commercialization functions must be integrated into the laboratory's administrative structure and the laboratory directors must be personally involved in encouraging and monitoring progress in this area.

We have to accept the fact that there will always be a technology transfer gap eating up precious time when Federal technology is spun-off to industry. Yet, if we don't narrow that gap, Federal technologies with commercial potential may not reach the market before next generation technology makes them obsolete. The speed of transfer must match the pace of technical change and the pace of our competitors or Federal technologies will be forever trapped solely in mission applications.

In my view, greater industry involvement at the very beginning of R&D at the Federal laboratories is essential if we are going to ensure that firms are aware of potentially useful R&D and to speed up the transfer and commercialization process. The potential for industry use of technology developed to meet

Federal needs should be considered up-front rather than as an afterthought once the R&D is completed. Industry involvement will promote knowledge and understanding of the capabilities industry can access in Federal laboratories and, in turn, Federal scientists and engineers will become more attuned to private sector needs.

In my view, personnel exchanges are excellent stepping stones toward fruitful alliances between Federal laboratories and U.S. industry. However, U.S. industry lags behind U.S. academic institutions as well as foreign countries and foreign organizations in participating in Federal laboratory personnel exchange programs. Accordingly, I believe Federal departments and agencies involved in R&D must redouble their efforts to promote closer cooperation with U.S. industry.

The Commerce Department is working with other departments and agencies to increase and ease industry's access to Federal laboratories. For example, Commerce is working, through the Interagency Committee, to make information on Federally-funded research more readily available to the private sector by expanding and improving the information in the Federal Research in Progress data base currently operated by the National Technical Information Service. The Commerce Department is co-sponsoring, with industry trade associations, a conference for the private sector to highlight Federal research in environmental technologies that is underway at the Departments of Energy and Commerce and the Environmental Protection Agency.

We are also working with the Department of Energy, the State of Tennessee, and the National Center for Manufacturing Sciences to create a regional outreach program to help transfer advanced manufacturing technology from Federal laboratories to small and medium-sized businesses in Tennessee and the Southeastern region of the United States. In another effort, we are assisting the State of New Mexico in developing a plan to support economic development in that state through the establishment of Federal-state-industry partnerships for commercializing technology from Federal laboratories.

The leadership that is needed to forge new relationships between Federal laboratories, states, and U.S. industry is illustrated by the Hanscomb Air Force Base in Massachusetts. Personnel at that base, particularly the Commanding Officer, General Gordon Fornell, took the initiative in establishing an agreement between the Department of Defense and the State of Massachusetts which taps the special expertise of the state development agencies to help link-up firms with technology transfer opportunities at the base.

The Federal Laboratory Consortium (FLC) has served as an excellent network in support of Federal laboratory technology transfer activities. I believe the FLC should be strengthened and made more effective by increasing Federal agency participation in the organization and its activities, including bringing in the top professionals in charge of Federal technology transfer programs. The FLC could then better address Federal laboratories' pervasive needs for top quality staff training in technology transfer as well as other important implementation issues.

I will mention one problem we face which requires immediate legislative action. Congresswoman Morella has introduced a bill (H.R. 191), which is co-sponsored by you, Congressman Thornton, that would provide copyright protection to valuable federal computer software developed in cooperation with the private sector. That proposal was also included in the President's National Energy Strategy Act. Almost all research today includes software. The lack of copyright protection has been cited by virtually every agency involved in R&D as a serious barrier to the commercialization of such software. Passage of this bill would have a significant impact by eliminating firms' concerns that their collaborative work with Federal laboratories may fall into the public domain--a situation which reduces significantly the incentives for private development and commercialization--and by encouraging Federal employees to develop software as part of the collaborative research.

Turning now to another matter, the Subcommittee has asked me to address the issue of purchases by foreign interests of small companies to which Federal research results have been transferred.

In the United States, many technologies, including those developed with Federal funding, are embedded in small firms. These firms are targets for acquisition by competitors, and such acquisitions are a continuing trend. It is perfectly understandable that small firms seek capital from investors to bring new technology to market or seek to license or sell that technology to attain a return on their investments in technology development.

Rather than reducing the flexibility and freedom our firms' have in forming business and financial alliances, the real issue we must address is creating an economic and cultural environment in the United States that is conducive to long-term investments in innovation and the rapid commercialization of new technology.

President Bush has proposed ways to reduce the Federal deficit and increase savings which would reduce the cost and increase the availability of capital in the United States. A permanent R&E tax credit would help increase investments in R&D. The Administration's proposed banking reforms would improve the health and flexibility of the banking system. Those who are concerned about the availability of capital for R&D should recognize that there is a connection between restoring the health of the banking system and the availability of capital for research, development and competition. Through a series of roundtables, the Departments of Commerce and the Treasury are working together with the financial and technical communities to explore ways in which capital can be better channeled to long-term technology investments.

In addition, we need to remove the barriers to the formation of valuable alliances. The National Cooperative Research Act of 1984, for example, is designed to help reduce the impact of escalating R&D costs by reducing antitrust uncertainties surrounding cooperative R&D. Today, with the cost of establishing production facilities rising, President Bush has proposed amending this Act to cover joint manufacturing as well. In addition, the Technology Administration will provide a neutral forum to help make it possible for industry to explore partnerships that link all the firms relating to a multi-use enabling technology, including suppliers, R&D performers, manufacturers and users.

The government must continue to remove unnecessary government restraints that impede U.S. industry's ability to develop and commercialize new technology. For example, the President continues to support reforming our expensive and cumbersome product liability system which many feel stifles innovation.

These approaches will help create a business environment which supports U.S. firms, including small entrepreneurial ones, and will continue to attract and retain business engines and technological innovations within our borders.

Thank you, Mr. Chairman. That completes my statement and I look forward to answering any questions you or the other Subcommittee members may have.

Ms. **Wince-Smith**. Excuse me. I would like to also mention and introduce the really outstanding staff I have here with us from the Commerce Department.

Mr. **Thornton**. Please do so.

Ms. **Wince-Smith**. Thank you, Mr. Chairman.

Mr. Joseph Allen is the Director of our Office of Technology Commercialization. Mr. John Paugh is Deputy Director in the Office of Technology Transfer. Mr. Dick Mullins a specialist in the office, and Ms. Evelyn Fields, who, I might add, is on a detail from NOAA, and is a commander of the NOAA Corps, so we are very honored having her work with us this year.

Thank you.

Mr. **Thornton**. Thank you very much for your excellent testimony.

We will continue to hear the direct summaries from each of our witnesses before we proceed to questioning, but I do want to welcome a former member of this committee, who has joined us, and we will be recognizing him in due course for such questions or comments as he may desire to make, Mr. Beryl Anthony, Fourth District, Arkansas.

Mrs. **Morella**. Mr. Chairman, before Mr. Anthony is recognized, if I could just ask you to yield a moment. I just wanted to make an observation. So usual is it that we have males who are at the table who introduce their staffs, and they turn around and they introduce the women, and I must say, Dr. Wince-Smith, I was just overwhelmed and very pleased at the introduction of the very capable staff. Thank you, and thank you, Mr. Chairman.

Mr. **Thornton**. I share in the celebration, but I must say, I am not at all surprised.

Shall we go next to Ms. Langenfeld?

Ms. **Langenfeld**. Thank you, Mr. Chairman, members of the subcommittee, and I do appreciate the consideration of letting me move on to this panel to try to get to Fermilab this afternoon. They are having their eleventh annual industrial affiliates meeting, and I will be there this afternoon speaking to them about technology transfer and the Department's program.

Mr. **Thornton**. A most worthwhile purpose, and we are pleased to put you forward into this panel. We do ask that you summarize the fine testimony that you have prepared and submitted to the committee.

Ms. **Langenfeld**. Absolutely. If I tried to read that, we would be here for hours.

I would like to comment in three general areas, the first some general comments on the GAO report; second, I would like to spend the bulk of my five minutes talking about DOE's efforts and enhanced technology transfer program; and then close with a few comments on the challenges ahead, but save most of that for the question and answer period.

We feel that the GAO report does make a valuable contribution towards describing the extent to which specific provisions of the Federal Tech Transfer Act, Stevenson-Wydler, and Executive Order 12591 are being implemented across agencies. However, the report did not cover the more recent National Competitiveness Technology Transfer Act of 1989, or the NCTTA, and it may not be as useful for fully understanding the scope of DOE's technology transfer efforts.

The FTTA focused on Government-owned, Government-operated laboratories, or the GOGO laboratories, of which the Department of Energy has only two. "With a formal technology transfer program organization required by the FTTA. There are two other smaller DOE GOGO laboratories having less than 200 employees each." The NCTTA, on the other hand, was specifically targeted at Government-owned, contractor-operated laboratories, or GOGO's, which constitute the vast majority of DOE's laboratory resources.

Since 16 of the 18 laboratories surveyed by the GAO were GOCO laboratories, the report does not fully reflect our commitment to technology transfer. For example, it is not surprising that most of the DOE labs surveyed reported they had not received written guidance on the FTTA. They have, however, since received guidance on the very important NCTTA, and I will talk about some of that in a minute.

To illustrate, I would like to provide a brief overview of that Enhanced Technology Transfer Program which encompasses the whole body of legislation—Stevenson-Wydler, Bayh-Dole, and others—as authorized by the Secretary of Energy in January of this year.

While many of our technology transfer efforts of DOE and the laboratories are not new, the NCTTA did provide new impetus to those efforts. It authorized us, thus, to establish technology transfer as a mission of all of our laboratories, including the defense-related laboratories. It also extended to these laboratories the use of CRADA's, which were previously available only to the GOGO's. So it has only been since late 1989 we have been able to use the CRADA device.

In looking at these provisions back in late 1989, we determined that it was time to reexamine the Department's overall approach to technology transfer. To conduct the review, Deputy Secretary Henson Moore authorized the formation of a Department-wide implementation project. All told, nearly 200 people participated in the review and implementation process from nearly every location and office in the DOE and contractor network. In addition, we gathered input from industry, State and local governments, universities, other Federal agencies throughout the implementation process. It resulted in what we referred to as DOE's Enhanced Technology Transfer Program.

This program starts with a vision, a vision of working in partnership with industry for the purpose of enhancing DOE's missions and U.S. competitiveness. The vision is grounded on a fundamental principle that the DOE, its laboratories and facilities can become more responsive and reliable partners with industry to strengthen our national competitiveness.

The program focuses on three primary goals. First, we want to increase the level of U.S.-based industry participation in DOE's R&D activities at all stages of program development and execution to introduce more market pull and user input into our processes. Second, we want to increase the level of DOE program, laboratory, and facility activity in transferring technology both to and from the private sector, consistent with our other missions and authorities; and, third, we want to accelerate the process by which that technology is transferred.

These goals, in turn, are supported by a series of strategies and implementing mechanisms. One of the most important mechanisms for implementing the program are the technology transfer contract clauses that have been incorporated into DOE's contracts with the GOGO laboratories. These clauses spell out a mutually agreed upon set of objectives between DOE and its contractors. The implementation of the technology transfer program at the laboratories is delegated to them, including CRADA's, outreach, and awards programs, and the contractors are responsible for developing local policies and procedures to implement it.

I feel we have made very significant progress in a short period of time. Seventeen of the 21 contract modifications we needed to make have been executed, including all of the large multi-program laboratories. In only six or seven months since we started completing those negotiations, over 60 CRADA's are already being negotiated across the laboratory network, some of which have already been executed and are in progress.

Other indicators, such as royalty income and licensing of intellectual property, are also increasing and have been since the FTTA. More importantly, we have established the foundation of an enhanced technology transfer program for the Department that builds on the combined experiences of our programs, laboratories, and facilities.

I would like to summarize now some of my responses to your specific questions and your invitation in terms of what needs to be done next. We believe we have a solid framework of legislation and administration policy guidance to meet our objectives. There are some new actions that we feel are required, such as Representative Morella's bill, H.R. 191, and these are described in my written statement and other administration documents, including the National Energy Strategy.

The major challenge for DOE in the coming months is to complete the integration of our Enhanced Technology Transfer Program into all departmental and laboratory activities, the culture change that we have been talking about earlier this morning. We are convinced that continuous education and training are essential to ensuring that all DOE and contractor employees are fully prepared to fulfill these technology transfer responsibilities.

As a first step, we held an orientation seminar in January for over 230 managers and staff from all DOE and contractor organizations. We have produced a one-hour videotape from that seminar which will soon be available to DOE and contractor locations to share with their employees and further communicate the message, and we are continuing to work on developing a more comprehensive training program.

We also need to provide incentives to researchers to work with industry and transfer commercially viable technology, such as through royalty sharing, promotion criteria, and other forms of recognition, and we are actively looking at new ways of doing that.

Finally, DOE and its contractors are continuing to develop the tools that our employees need to meet their responsibilities—training manuals and guides, such as those described this morning by

ITI, which, by the way, is partially funded by the Department of Energy; the DOE has also prepared a technology transfer orientation handbook which has been released on an interim basis and will soon be issued in final form; model CRADA's; guidelines; procedures for handling intellectual properties; and others—and we are trying to get those tools in the hands of the employees who can make a difference.

We are committed to improving the transfer of Federally-funded technology to the private sector. We believe that our programs, laboratories, and facilities are a national resource capable of providing significant scientific, engineering, and technological know-how that can help achieve the goals of the National Energy Strategy, support national security, and help enhance U.S. industrial competitiveness.

We are not alone in that belief, by the way. Moody's Investor Services recently upgraded its rating on the City of Oak Ridge, Tennessee's general obligation bonds from A to AA. The reasons cited include the city's sustained economic diversification and growth and the success of technology transfer from DOE's Oak Ridge National Laboratory to nondefense industries.

With Congress, the administration, the States, industry, universities, and the financial community behind us, we know that we will succeed in implementing this mission, and we look forward to working with you and other members of the subcommittee in the coming months.

Thank you.

[The prepared statement of Ms. Langenfeld follows:]

STATEMENT

OF

CHERRI J. LANGENFELD

DIRECTOR, OFFICE OF TECHNOLOGY ANALYSIS

U.S. DEPARTMENT OF ENERGY

CONCERNING

IMPLEMENTATION OF TECHNOLOGY TRANSFER LEGISLATION: DOE'S ENHANCED TECHNOLOGY TRANSFER PROGRAM

SUBMITTED TO THE

TECHNOLOGY AND COMPETITIVENESS SUBCOMMITTEE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

MAY 30, 1991

INTRODUCTION

Good morning, Mr. Chairman, and members of the Subcommittee. I want to thank you for the opportunity to testify on behalf of the Department of Energy (DOE) concerning our technology transfer activities. As requested in your letters of April 19 and May 14, 1991, my comments are structured around three general topics:

- General comments on the draft General Accounting Office (GAO) report, "Diffusing Innovations";
- Overview of DOE's Enhanced Technology Transfer Program; and,
- Responses to specific questions raised in the invitation to testify.

GENERAL COMMENTS ON THE DRAFT GAO REPORT, "DIFFUSING INNOVATIONS"

The draft GAO report, "Diffusing Innovations", describes the results of a GAO assessment of the extent to which federal departments and laboratories have implemented the provisions of the Stevenson-Wydler Technology Innovation Act of 1980 (SWTIA), the Federal Technology Transfer Act of 1986 (FTTA) and Executive Order No. 12591. Eighteen DOE laboratories were surveyed as part of the GAO's study. My comments today are based on the draft report, which we received on May 17, 1991.

We feel that the Report makes a valuable contribution towards describing the extent to which specific provisions of the SWTIA, the FTTA and Executive Order No. 12591 are being implemented across agencies. However, the report did not cover the implementation of the more recent National Competitiveness Technology Transfer Act of 1989 (NCTTA), and hence, may not be as useful for fully understanding the scope of DOE's technology transfer efforts. The FTTA focused on technology transfer at Government-Owned, Government-Operated (GOGO) laboratories, of which DOE has only two affected by the FTTA. The NCTTA, on the other hand, was specifically targeted at Government-Owned, Contractor-Operated (GOCO) laboratories, which constitute the vast majority of the Department of Energy's laboratory resources. Since 16 of the 18 DOE laboratories surveyed by the GAO were GOCO laboratories, the report does not fully reflect DOE's commitment to technology transfer. For example, since the FTTA did not apply to GOCO laboratories, it is not surprising that most of the DOE laboratories surveyed by the GAO reported that they had not received written guidance from DOE on the FTTA. These laboratories have, however, received written guidance from DOE on the NCTTA.

The report describes some aspects of DOE's ongoing efforts to encourage technology transfer from its laboratories. The GAO survey verified that all DOE laboratories have active, on-site Offices of Research and Technology Applications (ORTAs). Even when GOCOs are included in the count, a high percentage of DOE laboratories have satisfied other FTTA criteria upon which the study is based, such as royalty sharing and personnel exchanges. We are pleased to see that the GAO report provides independent validation that DOE and its laboratories are, indeed, responding to the legislation covered by the report. At the same time, we believe we can accomplish even more, and we have spent the last 18 months pursuing this goal.

DOE'S ENHANCED TECHNOLOGY TRANSFER PROGRAM

I would like now to offer a brief overview of the technology transfer program at the Department of Energy, as guided by both the FTTA and the NCTTA.

While many of the technology transfer efforts of DOE and its laboratories are not new, the NCTTA provided new impetus to these efforts. It authorized DOE to establish technology transfer as a mission of all DOE GOCO laboratories, including our defense-related laboratories. It also extended to the GOCO laboratories the use of CRADAs, which were previously available only to GOGO laboratories, as a major new mechanism for facilitating technology transfer. In addition, the NCTTA provided, for up to five-years, protection of information and data generated under technology transfer-related work with industry under CRADAs. As noted in the draft GAO report, such protection of information with potential commercial value is one of the primary means for encouraging increased industry collaboration with the laboratories.

In evaluating the implications of the NCTTA back in late 1989, DOE determined that it was time to re-examine the Department's overall approach to technology transfer. To conduct this review, Deputy Secretary Henson Moore authorized the formation of a Department-wide implementation project, consisting of two groups. At the headquarter's management level, the Technology Transfer Project Group (TTPG) provided the overall project direction and policy guidance for implementation. To ensure full participation of all laboratories, facilities, and DOE field elements, the Technology Transfer Field Task Force (TTFTF) was formed to provide practical, operations-oriented field input to the TTPG, and assist in the implementation. All told, nearly 200 people participated in the review and implementation process from nearly every location and office in the DOE network. In addition, the TTPG and TTFTF gathered input from people in industry, State and local government, universities, and other Federal agencies throughout the implementation process.

The work of the TTPG and the TTFTF--conducted over the period January 31, 1990 to January 24, 1991--resulted in what we refer to as DOE's Enhanced Technology Transfer Program. The basic elements of this Program were formally presented to Departmental personnel at DOE's Technology Transfer Orientation Seminar on January 24, 1991, and through a Secretarial Notice, SEN-30-91, "Setting the Course for Technology Transfer at the Department of Energy". With your permission, I would like to submit for the hearing record SEN-30-91 as an attachment to my written statement.

The Philosophy of Operations laid out in the SEN starts with a vision--a vision of working in partnership with industry for the purpose of enhancing DOE's mission and U.S. competitiveness. The vision is grounded on a fundamental principal--that the DOE and its laboratories and facilities can become more responsive and reliable partners with industry to strengthen our national competitiveness. To do so, we must improve the speed and certainty with which we conduct joint activities with industry.

The Philosophy of Operations focuses on three primary goals for enhancing technology transfer activities at DOE:

1) increase the level of U.S.-based industry participation in DOE's R&D activities at all stages of program development and execution;

2) increase the level of DOE program, laboratory and facility activity in transferring technology to and from the private sector, consistent with our other missions and authorities; and

3) accelerate the process of transferring technology and knowledge to U.S.-based private industry and consumers, as well as State and local governments.

These goals, in turn, are supported by a series of strategies. Some of these strategies include: increasing our use of collaborative, cost-shared agreements with industry; providing adequate intellectual property protection; ensuring fairness of opportunity for potential industrial partners, including small businesses; improving outreach to and feedback from industry; reducing administrative barriers that stand in the way of effective collaboration; and creating a robust set of "tools" or implementing mechanisms by which to accomplish the work.

One of the most important implementing mechanisms has been the technology transfer contract clauses that have been incorporated into DOE's contracts with its GOCO laboratories, as required by the NCTTA. These clauses clearly spell out a mutually-agreed upon set of objectives for technology transfer between DOE and its contractors. These objectives are fully consistent with the Philosophy of Operations that I just described. By focusing on the contract clauses to accomplish "goal setting," rather than turning to regulations that spell out the "how to" of technology transfer, we feel that we have taken a business approach to solving a business problem. Through these clauses, the contractors retain the flexibility to run the technology transfer program at their laboratories, while DOE maintains the appropriate level of management oversight.

Policies and procedures are another important implementing mechanism. The implementation of the laboratory technology transfer programs, through local policies and procedures, is delegated to the contractor organizations by the contract language itself. For DOE organizations, these responsibilities are delegated by Secretarial Notices and DOE Orders. The contract language also allowed us to achieve another important policy objective--issuing class waivers for DOE's patent rights to contractors who are not covered by the patent rights provisions of the Bayh-Dole Act of 1980. Through these class waivers, we believe we can balance the contractor's private interests with public goals. At the same time, we can improve our overall responsiveness to industry's needs and better promote the commercialization of DOE-funded technology.

Wherever possible, we have structured the enhanced technology transfer program to build on existing, successful policies and procedures. However, where existing policies represent barriers to implementing the program, or where supporting policies and procedures are non-existent, DOE must continue to work in partnership with its contractors to produce a comprehensive and coordinated set of DOE guidelines and contractor procedures to fully implement the program. Finally, in order to sustain the program over the long haul, we are working to establish an ongoing education and training program, supported by the necessary tools, to ensure that all DOE and contractor employees are fully prepared to take on the responsibility for technology transfer.

I feel we have made significant progress in a very short time:

- 17 of the 21 contract agreements necessary to carry out the NCTTA at DOE's GOCO laboratories have been executed, including all of the large, multi-program laboratories. The remaining four agreements are in the final stages of negotiation.

- Over 60 CRADAs are already being negotiated between DOE's contractor laboratories and industry, some of which have already been executed.

- Other indicators such as royalty income and licensing of intellectual property are also increasing.

- More importantly, we have established the foundations of an Enhanced Technology Transfer Program for the Department of Energy that builds on the combined experience of DOE's programs, laboratories, and facilities.

We believe we have the commitment and focus to continue our progress towards firmly establishing technology transfer as an integral mission of the Department of Energy.

RESPONSES TO SPECIFIC QUESTIONS

I'd like to turn, now, to the specific questions raised in your invitation. As with my earlier comments, my responses will refer to the Stevenson-Wydler Act as amended in both 1986 (the FTTA) and 1989 (the NCTTA).

1. *Are all agency and laboratory personnel aware of their responsibilities under the FTTA and the NCTTA?*

We believe that most DOE and contractor personnel are aware of their responsibilities under the FTTA and the NCTTA. However, we are convinced that continuous education and training are essential for ensuring that all DOE and contractor employees are fully prepared to fulfill these technology transfer responsibilities. As part of DOE's Enhanced Technology Transfer Program, we have redoubled our efforts to communicate these requirements to all employees and to provide the necessary training tools and support services to help them meet these requirements.

In the past, laboratory personnel who negotiated CRADAs or other collaborative agreements have received training--from both government-sponsored and externally-sponsored courses--to prepare them for these and other technology management responsibilities. In addition, most of the major DOE laboratories have developed formal handbooks or training guides for their employees, and provide training at the laboratories for technology management activities such as patenting, licensing and negotiations. Further, all of the major laboratories have formal procedures for their employees to follow in identifying and protecting intellectual property. Finally, the laboratory ORTAs are especially crucial for providing information and assistance to other laboratory employees in transferring technology.

DOE has also provided training in licensing, primarily for its patent attorneys and other negotiators. These courses have been, for the most part, externally sponsored through the Federal Laboratory Consortium, the Licensing Executive Society, or other private entities. Internal, semiannual patent counsel meetings keep both DOE and contractor personnel abreast of emerging intellectual property issues.

Although these activities have been very useful, the Technology Transfer Field Task Force identified the need for a more comprehensive approach to education and training, to better support DOE's Enhanced Technology Transfer Program. As a first step, we held an Orientation Seminar on January 24, 1991, for over 230 managers and staff from all DOE and contractor organizations. The Seminar included an Executive Session describing DOE's Enhanced Technology Transfer Program, followed by several workshops on CRADAs, intellectual property management, and other technology management issues. The Executive Session has since been reduced to a one-hour video-tape, which will soon be provided to all DOE and contractor locations to share with their employees.

We have also developed The DOE Technology Transfer Orientation Handbook, which was released in January on an interim basis to several hundred DOE and contractor employees for evaluation. Once the evaluation has been completed, we plan to make the Handbook available in final form to all employees. As we move forward with DOE's Enhanced Technology Transfer Program, we will continue to develop appropriate training programs for all employees. The basic elements around which such training will be developed have been defined as a result of extensive Headquarters and field discussions.

2. *Is there any evidence that technology transfer efforts are being considered in promotions?*

Most of DOE's facilities are contractor operated. Consequently, the contractor is responsible for establishing all personnel policy decisions, including promotion criteria, consistent with the contract requirements. Although the contracts do not specifically require that technology transfer be considered in promotion decisions, the contracts do establish technology transfer as a mission of the laboratories and provide the contractual framework for recognizing and rewarding individual and organizational technology transfer performance.

Although the practice is far from uniform across the laboratory system, anecdotal information suggests that some laboratory managers are beginning to incorporate technology transfer as a factor in employee performance appraisals. Other forms of recognition and reward are used more widely, such as awards programs and royalty payments for inventors. In addition to recognition for inventors, many organizations provide recognition for significant technology transfer activities to those other than the inventors. For example, both Oak Ridge National Laboratory and Pacific Northwest Laboratory reward non-inventors on an annual basis. Sandia

National Laboratories has an aggressive technology transfer awards program, which rewards inventors and non-inventors alike. In addition, there is a proposal currently under review by the Technology Transfer Project Group for a new departmental Technology Transfer Award.

Although DOE does not yet have formal agency-wide guidelines for weighing technology transfer involvement of scientific, technical, or management personnel in promotion decisions, there is increasing attention to this across the board. For example, Defense Programs has clearly enunciated such guidance in their "Defense Programs Technology Transfer Charter":

"Principle No. 3: Incentives should be provided to promote technology transfer related efforts.

o The program encourages, to the extent permitted by the corporate policies of the Management and Operating contractor, the establishment of an employee recognition program including awards to reward its personnel for exemplary activities contributing to technology transfer efforts.

o Personnel policies of DP facility operators should provide that contributions to technology transfer efforts as well as research publications be recognized for individual career advancement.

o Contractor organizations should be rewarded for their technology transfer efforts."

As we move forward with the Enhanced Technology Transfer Program, we will be evaluating additional methods for measuring and rewarding technology transfer success for both individuals and organizations across DOE and its laboratories and facilities.

3. *Which agencies and laboratories have successfully implemented the Act?*

While I cannot speak for the other agencies, I believe that the Department of Energy has successfully implemented the FTTA and is well on its way to successfully implementing the NCTTA. These accomplishments are well documented in two reports we have previously submitted to Congress, both pursuant to the NCTTA:

- Report to Congress on the Implementation of the National Competitiveness Technology Transfer Act of 1989, which was submitted May, 1990, and
- Report to Congress: Federal Laboratory Technology Transfer Activities, Accomplishments and Plans, which was submitted in February, 1991.

With your permission, I would like to include for the hearing record both of these documents as attachments to my written testimony.

4. *Can their procedures for implementation be transferred to other agencies and laboratories?*

Throughout the implementation of the NCTTA, we have made an enormous effort to have DOE and contractor employees share their experiences in technology transfer. For example, in developing the CRADA process, we drew heavily on our experiences with the very successful High Temperature Superconductivity Pilot Center Program. The communication is continuing, both on an ad hoc basis, and through more formal mechanisms, such as the Federal Laboratory Consortium and the Technology Transfer Society.

In addition, we have made an effort to follow the experiences and progress of other Federal agencies, State organizations, universities, and industry organizations in implementing the technology transfer mission. Several agencies, including OSTP, NASA, NIH, Agriculture, Commerce, Defense, and the Small Business Administration described their programs and objectives and shared materials with the TTPG and TTFTF during the implementation process. The Department of Commerce even had a representative on the TTFTF team for improving our outreach to industry. We have also teamed with Commerce on other initiatives, such as the Biotechnology Conference held in October, 1990. In the months ahead, we will be working with Commerce on two additional seminars, a workshop on advanced manufacturing at the Oak Ridge National Laboratory in June, 1991, and a conference on environmental technologies and Eastern Europe export opportunities in September, 1991. We will also be participating in NASA's Technology 2001 Conference in December, 1991.

We believe such activities within and between Federal agencies allow the agencies to learn about, and learn from, each other's efforts at implementing the complex and important mandate to transfer Federally-funded R&D to industry, where it can be commercialized. While some methods may not be fully transferrable due to the differences between GOCO and GOGO laboratories, many other methods can be applied widely. In this way, the best ideas and methods for working effectively with industry can be quickly transferred to other agencies and laboratories for the benefit of all.

5. *What steps need to be taken in the Executive Branch to complete implementation of the Act, and when will these steps be taken?*

The major challenge for DOE in the coming months is to complete the integration of our Enhanced Technology Transfer Program into all Departmental activities. We believe we have a solid framework of legislation and Administration policy guidance to meet our objectives. The Administration has made a clear commitment to technology transfer through a series of documents in the last year, including OSTP's Administration Technology Policy; the Technology Transfer Chapter of the National Energy Strategy; and the recently issued Fact Sheet from the Vice-President's Council on Competitiveness concerning the Report of the National Critical Technologies Panel.

These documents point to some specific administrative and legislative actions that would facilitate technology transfer. While not directly related to implementation of the FTTA or NCTTA, these actions would improve the financial, regulatory, and policy environment within which more effective industry-laboratory collaboration could occur. We are continuing to work with other agencies through the Vice-President's Council on Competitiveness, Working Group on Commercialization of Government Research, and the Interagency Committee for Laboratory Technology Transfer, to implement these actions and identify additional actions that might be required.

6. *Has sufficient delegation to laboratories of authority to enter Cooperative Research and Development Agreements (CRADAs) occurred?*

We are satisfied with the level of delegation of authority provided by the FTTA and NCTTA to enter into CRADAs, and to deal with related topics such as conflict of interest, intellectual property, fairness of opportunity, and U.S. competitiveness. As required by Executive Order No. 12591 and the FTTA, DOE's GOGO laboratories have been delegated authority to negotiate and execute CRADAs and license intellectual property, in consultation with the cognizant Program Secretarial Officer. In addition, as required by the NCTTA, DOE's GOCO laboratories have been authorized to negotiate and execute CRADAs and to conduct a wide range of technology transfer activities. To streamline the DOE approval process, we have delegated authority for DOE review of these agreements to the local Operations Office Managers, again in consultation with Program Secretarial Officers (PSOs).

7. *Can any conclusions be reached at this point regarding the usefulness of the CRADA authority and the royalty sharing provided under the Act?*

Although DOE's experience with CRADAs has been limited to date, we are already seeing signs that the CRADA will be an extremely valuable mechanism for improving our interactions with industry and thus promoting technology transfer from our laboratories. Laboratories and Program Offices are reporting a dramatic increase in industry interest in working with the DOE, since passage of the NCTTA. We already have at least 60 CRADAs in various stages of negotiation and approval.

Royalty sharing is also critically important, to provide incentives to researchers to work with industry and transfer commercially viable technology. As noted in the draft GAO report, the technology transfer process is not a science--it is an art that takes hard work and dedication, often in the face of rapidly changing circumstances. As the use of royalty sharing and other incentives has increased in our laboratories, we have seen continued growth in patent applications, licensing, and collaborative agreements of various types.

8. *What are the major roadblocks to transfer of technology from the federal laboratories?*

Through the development of the National Energy Strategy and the implementation of the NCTTA, we identified a wide variety of financial, regulatory, and administrative barriers to effective technology transfer, some of which are noted in the draft GAO report. These barriers are well documented in the Interim Report on the National Energy Strategy, released in April, 1990. Some of these barriers are within the ability of the DOE to address, such as burdensome, local administrative procedures, and we are working to eliminate such self-imposed barriers. Others require coordinated Administration and Congressional action, as described in the National Energy Strategy (NES), released in February, 1991. One of the primary recommendations of the NES is to better utilize existing policy and law to encourage technology transfer from federally-funded research facilities.

The NES also would improve financial incentives to encourage industry investment in research and development, by making the Research and Experimentation (R&E) tax credit permanent and by encouraging more collaborative, cost-shared R&D between industry and the Government. In addition, the NES would remove a variety of regulatory barriers that discourage collaboration and innovation. The NES encourages the protection of intellectual property, both domestically and abroad; seeks to reform anti-trust law to allow R&D consortia to conduct joint production activities; seeks to reform product liability laws to reduce the costs and risks of pursuing innovative technologies; calls for the reform of Federal procurement practices that discourage industry from working with the Government; seeks to balance conflict of interest concerns with tne need for more public-private collaboration; and seeks to make the laboratories more accessible to industry. The NES also emphasizes the importance of providing sufficient funding and resources to implement the federal technology transfer mission. Finally, the NES seeks to reform the national infrastructure for providing technology transfer services to improve public-private collaboration.

9. *Do any of these problems have a legislative solution?*

Most of the activities included in the NES for technology transfer do not require new legislation. The few that do, include:

- Making the R&E tax credit permanent, to provide greater incentives to industry to invest in R&D.
- Extending copyright protection to software works created by Federal employees, by amending the Stevenson-Wydler Act (H.R. 191).
- Extending the National Cooperative Research Act of 1984 to include production activities. The extension would give industry greater flexibility in pooling their R&D resources to advance the development of new technologies.

- Reforming product liability laws to reduce the risks and costs associated with the commercialization of innovative technologies.

We believe the remaining NES technology transfer actions can be accomplished within existing legislative authorities using existing administrative processes.

We do anticipate, however, that as our technology transfer activities increase in scope--for instance, as the number of CRADAs increases--new issues may arise which will require further administrative or legislative action. For example, topics that continue to arise within the context of industry-laboratory collaborations include protection of computer software creations that may not be covered by patent or copyright laws; the increasingly complicated disposition of intellectual property rights; and concerns over conflict of interest.

Finally, although the NCTTA resolved some of the differences between GOGO and GOCO laboratory authorities for technology transfer, we have continued to experience some difficulties in reconciling the different provisions of Bayh-Dole with Stevenson-Wydler and other legislative authorities of the Department. While the technology transfer contract clause negotiations have mitigated some of these issues, we will continue to monitor the progress of all DOE laboratories to determine if additional administrative or legislative changes are warranted.

CONCLUSION

The Department of Energy is committed to improving the transfer of Federally-funded technology to the private sector. We believe that the DOE's programs, laboratories and facilities are a national resource, capable of providing significant scientific, engineering, and technological know-how that can help achieve the goals of the NES, support national security, and help enhance U.S. industrial competitiveness. We are not alone in that belief. In a news brief dated May 9, 1991, it was reported that Moody's Investors Service upgraded its rating on the city of Oak Ridge, Tennessee's general obligation bonds from "A1" to Aa". The reasons cited included "the city's sustained economic diversification and growth" and the "success of technologies [sic] transfers from Oak Ridge National Laboratories to non-Defense industries."

With Congress, the Administration, the States, industry, universities, and the financial community behind us, we know we can succeed. We look forward to working with you and the other members of the committee in the coming months and years on this critically important mission of technology transfer.

U.S. Department of Energy
Washington, D.C.

Secretary of Energy
NOTICE

SEN-30-91

SUBJECT: SETTING THE COURSE FOR TECHNOLOGY TRANSFER AT THE DEPARTMENT OF ENERGY

DATE: 1-23-91

In my notice of September 5, 1989, I outlined the management objectives I felt were necessary to set a "new course" for the Department of Energy (DOE) in executing its mission responsibilities. This notice sets the course for one of those initiatives most important to achieving the Nation's energy, environmental, economic, and national security goals: technology transfer.

Because U.S. competitiveness in international markets is seriously challenged, I feel that it is important to move as quickly as possible to expand and enhance DOE's cooperative work with industry. Shorter product cycles demand faster translation of research and development (R&D) into marketable products and services, and existing transfer processes are often too slow to meet these requirements. Efforts to utilize the technologies and capabilities residing in DOE facilities to provide assistance to the private sector in improving our industrial competitiveness must be made more efficient and effective than in the past. The following "Philosophy of Operations" sets the vision and policy framework for immediately establishing an enhanced technology transfer program at the Department of Energy.

PHILOSOPHY OF OPERATIONS: TECHNOLOGY TRANSFER

Statement of Purpose

Preamble:

Through the National Energy Strategy (NES) process, it has become clear that basic scientific research and the development of advanced energy technologies is fundamental to the success of any national energy strategy. Further, the success of every technology-related strategy proposed in the NES depends on rapidly transferring the results of research and development activities into use. In fact, these fundamental principles apply across a broad range of national strategies, from agriculture, to space, to national defense.

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At the Department of Energy, our challenge is to support the search for fundamental knowledge, and then to help translate that knowledge into practical applications for the U.S. economy and U.S. defense. The DOE's programs, laboratories and facilities are a national resource, capable of providing significant scientific, engineering, and technological know-how that can help achieve the goals of the NES, support national security, and help enhance U.S. industrial competitiveness.

We have long been successful at sharing the results of our basic research programs (knowledge transfer)--both to and from the international scientific community. We have also proven our ability to support the transfer of applied research activities (direct transfer)--both to and from industry, universities, and State and local governments. Finally, our engineers and scientists have worked successfully with industry to find commercial applications for the results of many basic science and defense weapons research programs (spin-off and dual use transfer).

However, there is more that we can do. By building even closer partnerships with industry, other agencies, Congress, State and local governments, trade associations, universities, and other organizations, we can help "bridge the gap" between the point where Federal R&D has historically stopped and the point where industry commitment to commercialization can be made. With the leadership and support of DOE and contractor management, the Department's programs, field offices, laboratories and other facilities can be more responsive to the needs of U.S. industry. In this way, we can help U.S. industry develop economically and environmentally superior products and processes, create new jobs, enhance the skill level of the U.S. labor force, and increase the tax base, all of which contribute to U.S. economic strength and national security.

Mission:

The DOE technology transfer mission is to help enhance U.S. competitiveness and national security, by expanding and accelerating the transfer of Federally-funded technologies and knowledge into commercial applications by U.S.-based industry.

Goals:

In support of this mission, DOE will:

1. Increase the level of U.S.-based industry participation in DOE's research and development at all stages of program development and execution.

2. Increase the level of DOE program and laboratory activity in transferring technology, consistent with other program missions and authorities.

3. Accelerate the process of transferring technology and knowledge to U.S.-based private industry and consumers and State and local governments.

Management Philosophy

Based on the analysis of the public input for the National Energy Strategy, as well as the inputs made by an intra-Departmental working group, DOE has developed a comprehensive, integrated technology transfer strategy. Our approach centers on a philosophy of fostering strengthened collaborative relationships between Federally-supported programs and U.S. private industry throughout all phases of the programs. One of the overriding principles of our approach is that technology transfer can be improved by introducing more "market pull," where technology development efforts are more focused on meeting an identified need. To encourage increased collaboration, we need to:

- Improve the speed of the technology transfer process; and
- Improve the predictability of that process.

Improving the speed of the process is supported by the principles of localized decision-making, flexibility to meet the varying needs of outside partners, and simplified procedures. Improving the predictability of the process is supported by the principles of management oversight, consistency and accountability across operations, and clearly articulated policies and guidelines. Achieving the appropriate balance requires a close partnership between DOE, its contractors, industry, and other participants in the technology transfer process.

Strategies

DOE will build on existing, successful technology transfer models to pursue the following strategies in accomplishing our goals:

Goal 1: Increase industry participation

- Increase the use of cost-shared, collaborative agreements to better leverage public and private funds and to further encourage "market pull" of new technologies into and out of DOE programs and facilities.
- Protect technologies and information that can be used to enhance U.S. competitiveness or national security, to the extent permitted by U.S. law, international treaties and agreements, and consistent with other DOE missions.
- Establish clear policies on participation in collaborative programs and licensing agreements to ensure that the economic and technological benefits accrue to the U.S. economy.

- o Encourage all Departmental elements and other facilities to ensure fairness of opportunity for potential participants, recognizing the special needs of small businesses and non-profit organizations.

Goal 2: Increase DOE participation

- o Establish technology transfer as a fully-integrated mission of all Departmental elements, laboratories, and other appropriate facilities and evaluate the performance of each organization relative to fulfilling this mission.
- o Provide the sustained funding and resources necessary to implement the technology transfer mission, including support for cost-shared programs to develop "spinoff" applications and the development of generic, pre-competitive technologies.
- o Expand the use of incentives and recognition programs that encourage participation of Federal and contractor employees in the technology transfer program, including recognition for accelerating the conversion of DOE technology and know how into a form that can be protected, such as patents, copyrights, data, engineering drawings, etc.
- o Maintain support for basic scientific and technological research programs that are important to the Nation's long-term energy, economic, environmental, and national security goals, in order to retain a national pool of scientific and engineering expertise.

Goal 3: Accelerate the process

- o Develop more effective technology transfer partnerships between the DOE, its laboratories and other facilities, other Federal agencies, State and local governments, universities, industry, and various professional and industry associations.
- o Extend the use of end-user and technical advisory groups, industry consortia, joint ventures, and other interactive mechanisms to ensure industry input in all phases of research and development.
- o Improve "outreach" to industry, provide greater access to facilities that promote technology deployment, and increase the exchange of personnel and information between the laboratories, production plants and other facilities, and universities and industry.
- o Eliminate administrative barriers to collaboration between industry and DOE or its agents, by simplifying procedures and promoting greater consistency across operations.

Roles and Responsibilities

There are four general levels of management at the DOE that must be considered in identifying roles and responsibilities for managing technology transfer:

- The Secretary of Energy. As the senior Departmental official, the Secretary of Energy provides the broad policy direction for the Department and implements technology transfer programs and policies through the Program Secretarial Officers. The Secretary relies on a variety of Senior Staff Officers to advise him and help implement his policy directions. These include the Deputy Secretary, Under Secretary, Deputy Under Secretary for Policy, Planning and Analysis, General Counsel, Assistant Secretary of Congressional Affairs, and the Directors of various staff support offices.

- Program Secretarial Officers. This category includes Assistant Secretaries and Directors who have line management responsibilities for DOE's R&D and technology transfer programs (e.g., Energy Research, Fossil Energy, Defense Programs, Conservation and Renewable Energy, etc). Some of these officers also have management oversight responsibility for DOE's field offices, laboratories and facilities.

- Field Office Managers. These offices include the eight operations offices and their affiliated area and regional support offices. In the case of Fossil Energy, this category may also encompass the Energy Technology Centers at Morgantown, WV, and Pittsburgh, PA, for certain activities.

- Laboratory Director or Equivalent. Most of DOE's laboratories and facilities are run by Management and Operating (M&O) contractors. While the titles may vary, each laboratory and facility has a lead manager, employed by the contractor, who acts as an agent of the contractor in conducting technology transfer activities.

The broad roles and responsibilities of each of these management levels are as follows:

DOE Secretary

- Establish the broad policies and guidelines that serve as the consistent framework within which the Department's technology transfer activities are conducted.

- Coordinate with other agencies, Congress, and other national and international organizations in establishing policies and programs that facilitate private sector access to the scientific and technological capability of DOE and its laboratories and facilities.

- o Provide the required financial and human resources, including the necessary training and education, to support the technology transfer missions of DOE and its laboratories and other facilities.
- o Delegate, to the extent feasible, decision-making for the technology transfer program to the appropriate organizational level for effective implementation of the program, and provide adequate flexibility for these organizations to be responsive to the needs of the marketplace.
- o Establish and communicate the standards of performance and success by which these organizations will be measured, and review that progress.

Program Secretarial Officers

- o Determine each program's technology transfer role, within the broad policy framework of the Department and consistent with other programmatic missions and statutory authorities.
- o Provide input to the development of cross-cutting Departmental policies and procedures, assure coordination of activities that have multi-program implications, and promote the sharing of information on activities and "lessons learned" in technology transfer both inside and outside DOE.
- o Develop the supporting policies, strategies and plans to implement each program's technology transfer mission, consistent with other program missions, and to further delegate decision-making responsibility, as appropriate, to the field offices and facility directors.
- o Seek the necessary resources to implement these plans, and maintain oversight of those resources to assure appropriate uses.
- o Evaluate the progress and effectiveness of these technology transfer programs, whether they are managed directly by the program office or whether they have been delegated to a field office manager or facility director.
- o Conduct outreach initiatives that focus on program-specific third-party participants, such as industry consortia, State and local governments, universities, trade associations, etc.

Field Office Managers

- o Support and implement the directions and policies of the Secretary and Program Secretarial Officers.

- Assist in formulating and refining Departmental and programmatic policies and procedures.
- Negotiate appropriate technology transfer contract provisions with the M&O contractors on behalf of DOE.
- Review and approve collaborative agreements in consultation with the Program Secretarial Officers.
- Develop and improve local procedures for processing these agreements in a timely manner consistent with the guidance of DOE management.
- Appraise and report on the technology transfer program of each DOE laboratory and facility.
- Assure protection of intellectual property and commercially valuable information for the technology transfer mission.

Laboratory Director or Equivalent

- Plan and conduct the laboratory or facility technology transfer program.
- Provide input on policies and procedures.
- Comply with contract provisions and any other agreed-upon policies, and define supporting lab facility procedures where required.
- Plan, monitor, and evaluate the laboratory's or facility's technology transfer program, consistent with Departmental and programmatic guidance.
- Demonstrate fiscal and mission responsibility to all missions while conducting the technology transfer mission.

Authorizations

As part of the National Defense Authorization Act for Fiscal Years 1990 and 1991 (Public Law 101-189), Congress enacted the National Competitiveness Technology Transfer Act (NCTTA) of 1989. The law further amends the Stevenson-Wydler Technology Innovation Act of 1980, which was previously amended by the Technology Transfer Act of 1986. The NCTTA directed DOE to offer contract provisions to establish technology transfer as a mission of DOE Government-Owned, Contractor-Operated (GOCO) research and development laboratories, setting forth new contract provisions and operating requirements for government agencies and their GOCOs. In addition, the law provides GOCO R&D laboratory directors with the authority to negotiate and enter into Cooperative Research and Development Agreements (CRADAs) subject to approved joint work statements, similar to authority previously granted to the directors of Government-Owned, Government-Operated R&D laboratories.

The technology transfer mission of the R&D laboratories and facilities, including CRADAs, will be conducted in a manner that is consistent with the policy, principles, and purposes of the Stevenson-Wydler Technology Innovation Act of 1980 (as amended) (15 U.S.C. 3710(a)); Section 3132(b) of Public Law 101-189; chapter 18 of title 35, U.S. Code, commonly referred to as Bayh-Dole (35 U.S.C. 200 et seq); Section 152 of the Atomic Energy Act of 1954 (as amended) (42 U.S.C. 2182); Section 9 of the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5908); and Executive Order 12591 of April 10, 1987, and consistent with the overall technology transfer mission of the Department. The Office of Naval Nuclear Reactors will continue to perform technology transfer in accordance with applicable law and existing program policies.

The Deputy Secretary will continue to coordinate Departmental efforts to implement this enhanced technology transfer strategy.

James D. Watkins
Admiral, U.S. Navy (Retired)

REPORT TO CONGRESS
FEDERAL LABORATORY TECHNOLOGY TRANSFER ACTIVITIES, ACCOMPLISHMENTS AND PLANS

As Required by the
NATIONAL COMPETITIVENESS TECHNOLOGY TRANSFER ACT OF 1989

Prepared by the
U.S. Department of Energy
February 1991

ANNUAL REPORT TO CONGRESS ON FEDERAL LABORATORY TECHNOLOGY TRANSFER ACTIVITIES, ACCOMPLISHMENTS AND PLANS

INTRODUCTION

This report is presented pursuant to the National Competitiveness Technology Transfer Act of 1989 (Public Law 101-189) amendment to the Stevenson-Wydler Technology Innovation Act of 1980 (Public Law 96-480). The National Competitiveness Technology Transfer Act (NCTTA) added a requirement that "the Agency provide a report on its technology transfer program for the preceding year and its plans for conducting its technology transfer function for the upcoming year, including plans for securing intellectual property rights in laboratory innovations with commercial promise and plans for managing such innovations so as to benefit the competitiveness of United States industry." As this report illustrates, the Act, other related legislation, and agency initiatives are already having a powerful impact encouraging increased contributions by the Department of Energy (DOE) and its laboratories to U. S. economic competitiveness.

The report is organized into three sections that describe the status of the implementation of the NCTTA, report on the laboratory technology transfer program for FY 1990, and present plans for the technology transfer function in FY 1991. It provides a summary of representative activities in an area the Department is committed to fostering even greater achievements in the years ahead.

IMPLEMENTATION OF THE NATIONAL COMPETITIVENESS TECHNOLOGY TRANSFER ACT OF 1989

Following the passage of the NCTTA in November 1989, DOE moved swiftly to begin the implementation of the provisions of the Act. The first step was to evaluate the implications of the legislation from both programmatic and contractor perspectives. The evaluations indicated that:

- The DOE should take the opportunity to explicitly address the full direction and intent of the legislation, and target the development of a comprehensive, integrated technology transfer plan that includes all laboratories and Departmental elements.

- A coordinated and well-managed process was essential for DOE to develop the policy framework needed to propose an appropriate contract clause to the laboratory contractors by the target date required by the Act.

On January 31, 1990, the Deputy Secretary of the Department of Energy initiated the second phase of the implementation process by authorizing the formation of a Technology Transfer Project Group (TTPG) and a Technology Transfer Field Task Force (TTFTF). The TTPG, consisting of senior managers and staff from every major program and support organization, was assigned responsibility for leading the overall implementation efforts and developing policy recommendations for executive approval.

The TTFTF was responsible for coordinating and developing input and supporting information from the DOE Field Offices, Headquarters, and laboratory contractors on a wide range of topics, including:

1. Philosophy of Operations
2. Contract Modifications
3. Cooperative Research and Development Agreements (CRADAs)
4. Conflict Management
5. Partner Selection
6. Use of Funds
7. Evaluation and Oversight

Upon their formation, both the TTPG and the TTFTF began developing policies and procedures in each of the various areas for implementation in the final phase of the process. Highlights of the results of the process include:

- Development of a clause for modifying the contracts of 18 contractors operating 21 different DOE laboratory facilities;
- Development of a model CRADA for use by the laboratories, and establishment of procedures for DOE review of both CRADAs and the Joint Work Statements for CRADAs which assign rights among the participating parties;
- Establishment of a policy framework for use by both DOE and contractor employees concerning issues critical to the appropriate conduct of technology transfer activities; these issues include conflict-of-interest, fairness-of-opportunity, consideration for small and non-profit businesses, U.S. preference, protection of proprietary data, and evaluation and reporting requirements; and
- Development of a technology transfer orientation handbook for use by DOE and laboratory employees.

Further details on the various activities and results of the implementation process are contained in the Report to Congress on the Implementation of the National Competitiveness Technology Transfer Act of 1989, which was submitted pursuant to the NCTTA on May 29, 1990.

The Contract Modification Clause developed in response to the NCTTA was presented to the laboratory contractors on April 27, 1990. The Department believes that the clause meets the requirements of the NCTTA by adequately protecting the public interest, while providing new opportunities for strengthened relationships between the private sector and the laboratories.

While some revisions have been made in the clause in the course of negotiations with the various contractors, the highest degree of consistency possible has been maintained. A recent Departmental review of the clause (conducted in accordance with the requirements of the 1991 National Defense Authorization Act) found that each of its provisions are necessary to comply with the NCTTA and the Stevenson-Wydler Technology Innovation Act, or are necessary to describe adequately the respective obligations and responsibilities of the DOE and its laboratory contractors.

To date, negotiations on the clause have been successfully completed with 12 not-for-profit laboratory contractors and 3 for-profit contractors. Negotiations with most of the other contractors are in their final stages. Implementation of the clause is already yielding results. The first CRADAs between DOE laboratories and U.S. industry have already been established, and more than 60 others are currently being negotiated.

THE FY 1990 DOE LABORATORY TECHNOLOGY TRANSFER PROGRAM

For several years, DOE has required that each laboratory conduct the technology transfer functions incorporated in the original Stevenson-Wydler Act. Under this policy, each laboratory is required to establish an Office of Research and Technology Applications (ORTA) function, and report its plans and accomplishments to the Department. However, each laboratory has the flexibility to design and implement its own technology transfer program consistent with its particular research missions. In addition, DOE's not-for-profit contractors have had the option of taking title to laboratory inventions (except those in classified or sensitive areas) since 1985. For-profit contractors have also been able to obtain title to such inventions, with DOE approval, on a case-by-case basis.

While many of the technology transfer efforts of the DOE and its laboratories are not new, the NCTTA provided new impetus to these efforts and established CRADAS as a major new mechanism for facilitating technology transfer. In addition, a key provision of the NCTTA was its official establishment of technology transfer as a fundamental mission of all DOE laboratories. In FY 1990, the Department and its laboratories strengthened their efforts to assist U.S. economic competitiveness in accordance with this enhanced mission.

TECHNOLOGY TRANSFER PLANS FOR FY 1991

In FY 1991, DOE and its laboratories plan to aggressively pursue opportunities to develop cooperative relationships with private industry through CRADAs and to strengthen on-going efforts to identify and manage intellectual property. These efforts will encompass all types of DOE R&D programs, including basic science, applied energy, and defense-related programs. It will also involve all DOE-supported laboratories, including government-owned contractor-operated (GOCO) laboratories and government-owned government-operated laboratories (GOGO) laboratories.

The majority of DOE-supported R&D activities are conducted at GOCO laboratories. As stated previously, all DOE not-for-profit operating contractors have had the ability to elect to take title to laboratory inventions (except those in classified or nuclear-sensitive areas) for several years. The for-profit contractors have previously had to seek DOE approval for such actions on a case-by-case basis. However, a Class Waiver agreement granting Martin-Marietta Energy Systems (a for-profit contractor) the ability to elect ownership to a broad class of inventions in a manner similar to the not-for-profit contractors was recently approved. The Department plans to use this agreement as a model for establishing similar agreements with other DOE for-profit laboratory contractors in FY 1991.

The changes in culture necessary to implement effective intellectual property management across all of the laboratories will take time to establish. These changes are now well along, and all of the major contractors have systems in place for identifying intellectual property, managing its patenting and licensing, recognizing and rewarding inventors, and other activities necessary for effective intellectual property management. The NCTTA and its implementation have given a major new impetus to these activities. Efforts to broadly disseminate opportunities for licensing and cooperative research at the laboratories are planned to be expanded in FY 1991. The laboratories will continue to license technologies on both an exclusive and non-exclusive basis, depending upon the nature of the technology being licensed and the additional investment required to commercially apply it. However, exclusive licenses will generally be limited to a specific field-of-use, to ensure the widest possible application of the technologies.

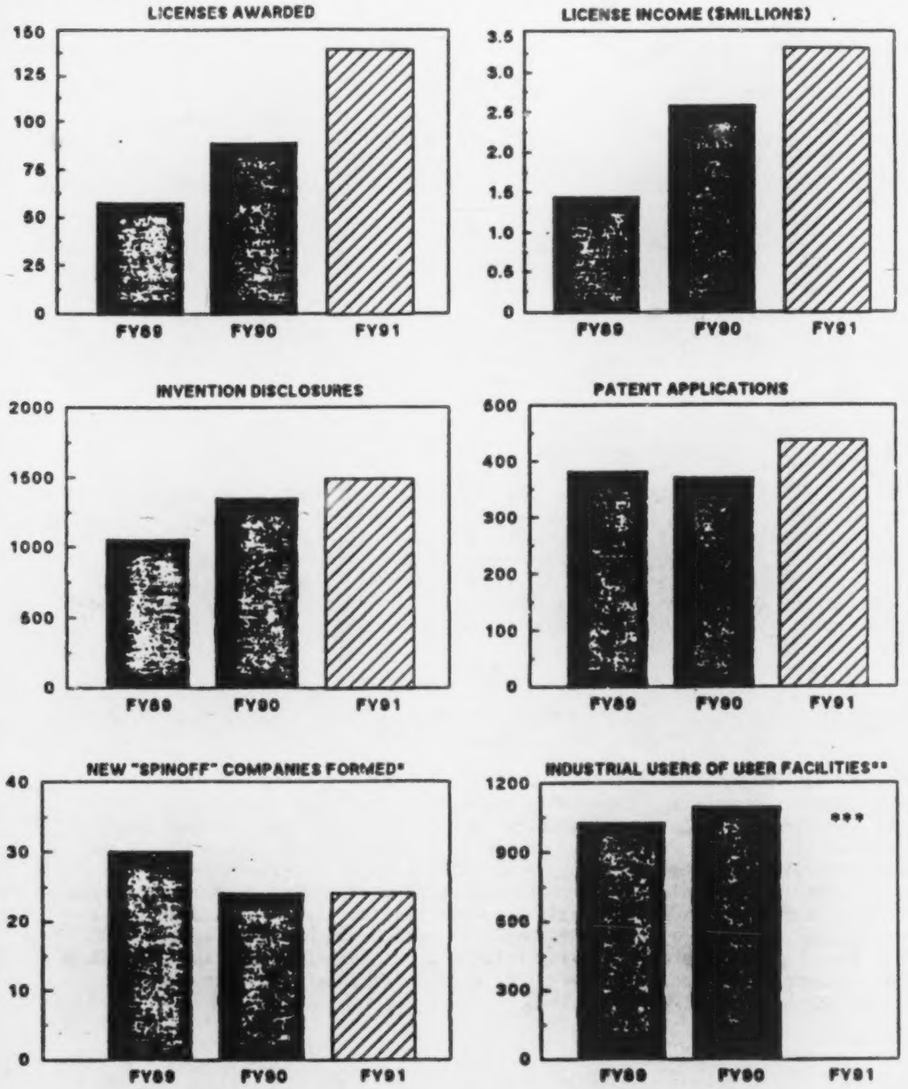
N[illegible]phasis will be placed on the use of all types of technology transfer mechanisms in FY 1991, with a particular focus on the development of CRADAs between the laboratories and U.S. industrial partners. The laboratories are already actively working to identify R&D areas appropriate for CRADAs and to enlist participation by U.S. industry in these CRADAs. They forecast that approximately 140 CRADAs will be established in FY 1991.

The Department is working to ensure that approval processes for the CRADAs will address necessary issues in a speedy and efficient manner. Both DOE and laboratory management view the establishment of CRADAs with U.S. industry in FY 1991 as an important priority. All of the major DOE program offices, including the Office of Energy Research, the Office of Defense Programs, and the Office of Environmental Restoration & Waste Management, plan to increase their funding support for technology transfer. The Department and its laboratories are also planning an increased emphasis on the evaluation of technology transfer efforts to ensure that the resources applied to technology transfer are being used as productively as possible.

Although the contributions of the DOE laboratories to U.S. industrial competitiveness are already substantial, the Department and its laboratories continue to believe they can be increased. Most of the legislative and policy authorities necessary to improve technology transfer from the laboratories are now in place. In FY 1991 and beyond, the emphasis will be on fully utilizing and implementing these authorities to benefit U.S. industry.

Recent historical trends and planning estimates for FY 1991 for several measures of technology transfer are illustrated in the attached figures. These figures illustrate the progress being made in technology transfer in terms of some commonly-used measures focused on the development and management of intellectual property. A more complete picture of the accomplishments of the laboratories in technology transfer in FY 1990 can be gained through descriptions of actual technology transfers occurring in a wide range of areas. A partial listing of examples in the areas of energy, advanced materials, manufacturing processes, environment/waste management, biomedical applications, and high-performance computing follows.

HISTORICAL TECHNOLOGY TRANSFER TRENDS AND FORECASTS FOR FY 1991 AT DOE LABORATORIES



*SPINOFF COMPANIES ARE COMPANIES FORMED BASED ON LABORATORY TECHNOLOGIES

**TOTAL EXPERIMENTERS FROM PRIVATE COMPANIES USING DESIGNATED USER FACILITIES

***FORECAST NOT AVAILABLE

ENERGY

Lawrence Berkeley Laboratory (LBL) has licensed a solid-state lithium battery that offers the highest energy and power per unit of any battery currently available. The new battery has potential for commercial use in a variety of applications, ranging from a back-up energy source in industrial-scale power plants to a button cell in hand-held calculators. The new technology delivers 2 to 4 times the capacity of state-of-the-art commercial lithium coin cells, and 30 to 100 percent greater capacity than commercial "D" size nickel-cadmium batteries, with a 50 percent reduction in weight.

Scientists at the Solar Energy Research Institute (SERI) have developed new high-performance wind turbine blades for use by the U.S. wind industry. The turbine blades have been tailored specifically for operation in the highly turbulent wind environment near the ground where wind turbines must perform. In side-by-side tests against turbines with old-style blades, energy output increased by 20 to 25 percent. Performance verification was accomplished through joint ventures with both a private manufacturer and a private user of wind turbines. Industry experts project a potential market of $30 million for eventual replacement of the approximately 3,600 wind turbines with foreign-built blades that currently operate in California.

Los Alamos National Laboratory (LANL) and Sandia National Laboratories (SNL) are assisting U.S. oil production companies in efforts to find new ways to map and characterize domestic oil fields. The technologies being explored in these collaborative R&D efforts are spinoff applications of technologies originally developed for use in defense-related R&D. Included among the technologies are seismic methods for underground imaging that are believed to hold significant promise for mapping rock strata and subsurface faulting.

ADVANCED MATERIALS

Argonne National Laboratory (ANL) recently licensed a technology for superconducting wire and tape to Illinois Superconductor Corporation, the Nation's first private superconductivity company formed through the joint involvement of state and federal government organizations, private industry and universities. The technology deals with ways to improve the current-carrying ability of high-temperature superconductors, make them less brittle, and reduce their risk of damage if they overheat and lose superconductivity. Currently, there are 31 active cooperative agreements between the three DOE High-Temperature Superconductivity Pilot Centers (at ANL, ORNL and LANL) and U.S. industrial companies. Several technology licenses and technical breakthroughs have already resulted.

Scientists at Lawrence Livermore National Laboratory (LLNL) have begun working with industry to identify commercial applications for a new type of extremely lightweight, porous, and chemically-inert material known as aerogels. LLNL researchers have been working with aerogels since 1985, and recently developed one whose density is one-tenth that of the lightest aerogel ever made. Aerogels are believed to have significant potential for use in insulation, sonic detectors and acoustic delay lines, gas filters, and as a fuel storage media. More than 300 inquiries have been received from companies interested in learning more about aerogels since LLNL made its original announcement about its work with the materials.

MANUFACTURING PROCESSES

Pacific Northwest Laboratory (PNL) licensed a new, low-cost process for making high-quality oxide ceramic powder for solid-state electrolyte systems, such as those used in advanced fuel cells. The glycine nitrate process produces chromite powders that are superior to any presently available commercial powders in terms of reactivity/sintering properties and required processing temperatures. The development is expected to enhance U.S. industrial competitiveness in the manufacture of ceramics, and is attracting interest from a wide range of industrial companies.

Oak Ridge National Laboratory jointly developed with American Superconductor Corporation a process for fabrication of long lengths of superconducting wires by deformation and thermal processing. Such wires have potential for use in energy-efficient motors, generators, and energy storage devices. The development is a significant step in advancing U.S. competitiveness in the emerging superconducting equipment industry.

Scientists and engineers from 14 U.S. companies are teaming with SNL in a new initiative to increase U.S. competitiveness in the world specialty metals market. Collaborative R&D projects being undertaken in the initiative include work on high-current vacuum arc remelting, electroslag remelting, plasma arc remelting, modeling of flow and solidification, and characterization of materials manufactured by plasmas burning in reactive gases. Under the agreements, each member company will contribute $50,000 per year for five years, and DOE will provide matching funds for collaborative research.

The DOE Office of Defense Programs (DP) has established an Advanced Manufacturing Initiative involving several DOE laboratories and facilities to provide for the rapid advance of the manufacturing capabilities of both DP and U.S. industry. The technologies involved include advanced machine tools, control systems, measurement equipment, and advanced quality control methods. The first effort under this initiative will be with the National Center for Manufacturing Sciences, an R&D consortium of over 100 member firms.

ENVIRONMENT/WASTE MANAGEMENT

PNL licensed a ceramic melter technology that has the potential to make a significant contribution to addressing the waste disposal problems created by solid waste treatment facilities. Disposing of fly and bottom ash from such facilities has traditionally been a major problem. The PNL-developed technology is capable of glassifying and stabilizing the ash for reuse as a construction product. Thus, the disposal of the ash can be better managed, and a useful product created. The technology was licensed to the Nation's leading municipal solid waste composting company, which plans to extend its use to treatment facilities throughout the country.

ANL is working with industrial food processing and chemical companies to commercially apply a technology for converting food processing waste streams into lactic acid. The technology bioconverts existing food-processing waste streams into lactic acid, which can be used in making biodegradable plastics. Successful application of this technology could both reduce waste stream disposal problems, and result in the development of a beneficial new product.

BIOMEDICAL APPLICATIONS

Brookhaven National Laboratory licensed a technology for cloning and expression of the gene for bacteriophage T7 RNA polymerase. This invention is an improvement over commercially available cloning systems because it works well with a large number of genes and produces large volumes of clones rapidly and reliably. The technology has potential uses in a wide range of areas, from research applications in plant genetic engineering to clinical applications in insulin production. Thus far, 58 commercial firms, ranging from small research firms to large pharmaceutical companies, have taken license to the invention.

Fermi National Accelerator Laboratory (Fermilab) completed a collaborative effort to transfer proton accelerator technology for use in the treatment of cancer. A proton therapy accelerator was designed and built at Fermilab and shipped to the Loma Linda University Medical Center in California for use in a new treatment center. The treatment center has been designed to serve up to 100 patients per 10-hour day, and can treat more if a longer shift is used. Physicians working at the center, along with scientists from LBL and Harvard University/ Massachusetts General Hospital, will generate data on the value of proton therapy that will be available world-wide.

HIGH-PERFORMANCE COMPUTING

LLNL licensed an archival computer software code designed to manage the storage and retrieval of large files and large numbers of files resident on supercomputer systems. The software program automatically retains frequently used files on magnetic disks and sends rarely used files to other, more cost-effective storage media, such as automated tape libraries. The code has been licensed to General Atomics, who is marketing it under the name "UniTree." General Atomics had already licensed UniTree to several major computer equipment manufacturers, and negotiations are on-going with several others.

LANL is assisting Chevron Company in the use of massively parallel computing methods for performing oil reservoir simulations. The collaboration resulted in a successful test run of a reservoir simulation model with over two million grid points using LANL's Connection Machine. This simulation model is about two orders of magnitude larger than those typically used in the oil industry, and greatly improves the geologic definition of reservoir models that is vital to predicting reservoir performance.

United States Department of Energy

Report
to
Congress

Implementation: National Competitiveness Technology Transfer Act of 1989

May 25, 1990

The National Competitiveness Technology Transfer Act of 1989

A Report to Congress

Introduction

On November 29, 1989, the President signed into law the National Competitiveness Technology Transfer Act (NCTTA) of 1989 (Section 3133 (c) Public Law 101-189). The purposes of the NCTTA are to:

- Enhance U.S. national security by promoting technology transfer between Government-Owned, Contractor-Operated (GOCO) laboratories and the private sector in the United States; and

- Enhance collaboration between universities, the private sector, and GOCO laboratories in order to foster the development of technologies in areas of significant economic potential.

Within 150 days after the Act was signed, each agency with a GOCO laboratory was required to offer appropriate contract provisions to each contractor that would establish technology transfer as a laboratory mission and meet other requirements of the NCTTA. On April 27, 1990, the Department approved a model technology transfer contract clause, which has been presented to each laboratory contractor. Negotiations between DOE and its laboratory contractors are underway at this time.

The legislation also requires DOE to report on those contract modifications 30 days later. To meet this requirement, this report describes the DOE implementation process, summarizes accomplishments to date, and outlines the plan for completing the implementation.

The DOE Implementation Process

The Department's implementation process consists of three phases.

Phase I

During the first phase, which ran from the end of November 1989 to the end of January 1990, the Department thoroughly evaluated the implications of the legislation from programmatic and contractor perspectives. In reviewing the results of those evaluations, we determined that:

- The DOE should take the opportunity to go beyond the minimum requirements of the legislation and target the development of a comprehensive, integrated technology transfer plan that includes all laboratories and Departmental elements.
- A coordinated and well-managed process was essential for DOE to develop the policy framework needed to propose an appropriate contract clause to the laboratory contractors by the April 28, 1990, target date.

Phase II

On January 31, 1990, the Deputy Secretary authorized Phase II of the implementation with the formation of the Technology Transfer Project Group (TTPG). As a measure of the Department's commitment to the initiative, the membership of the TTPG consists of senior managers (Deputy Assistant Secretary and Office Director level) and staff from every major program and support organization. Coordinated by the Office of Policy, Planning and Analysis, the TTPG was assigned responsibility for leading the overall implementation efforts and developing policy recommendations for executive approval.

The Deputy Secretary also authorized the formation of the Technology Transfer Field Task Force (TTFTF), led by the Albuquerque Operations Office. To encourage teamwork and ensure that all viewpoints and experiences were represented, the TTFTF includes participants from DOE's Operations Offices, laboratories, laboratory contractors, and Headquarters. This TTFTF is responsible for conducting major portions of the development work and providing input to the TTPG. This task force was further sub-divided into seven teams, as illustrated in Figure 1.

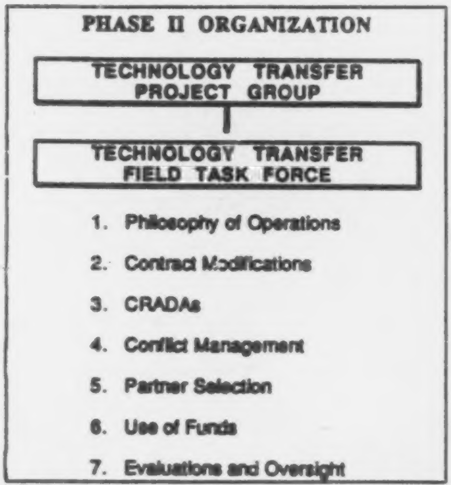

PHASE II ORGANIZATION
TECHNOLOGY TRANSFER PROJECT GROUP
TECHNOLOGY TRANSFER FIELD TASK FORCE
1. Philosophy of Operations
2. Contract Modifications
3. CRADAs
4. Conflict Management
5. Partner Selection
6. Use of Funds
7. Evaluations and Oversight

Figure 1

Since early February 1990, over 100 people on the TTPG and the TTFTF have been aggressively pursuing the Phase II objectives. These objectives were to perform the tasks mandated in the legislation and to identify additional work that would be needed to fully implement the enhanced technology transfer program. As part of that process, the TTPG/TTFTF solicited a wide range of input from other agencies, states, universities, and industry. Figure 2 illustrates many of the key milestones associated with Phase II. A complete list of participants, both internal and external, is included in this report as Appendix A.

KEY MILESTONES

• November 29, 1989	NCTTA Signed Into Law
• January 31, 1990	TTPG and TTFTF Formed
• March 7	Round Table Meeting (Wash)
• March 16	TTFTF Issue Papers Drafted
• March 21&23	TTPG Workshop (Wash)
• March 28-29	TTFTF Mid-course Meeting (CH)
• April 6	Draft Contract Mod to Contractors
• April 13	Contract Comments to HQ
• April 26	CRADA-Industry Meeting (ABQ)
• April 27	Contract Mod to Contractors
• May 25	Report to Congress
• May 30	TTFTF Review Meeting (ABQ)

Figure 2

Phase III

We are now beginning the final phase of the implementation, which will focus on putting the policies and procedures that have been developed into practice. The TTPG will continue to provide overall coordination and policy guidance. The Field Task Force is being reorganized into four implementation teams. These teams are described in more detail in the final section of this report.

Accomplishments

Through this dedicated effort, the DOE has achieved a number of important results. Some of these accomplishments extend well beyond the minimum requirements of the legislation and will significantly enhance the Department's technology transfer efforts.

Technology Transfer: DOE Philosophy of Operations

One of the most significant accomplishments has been the development of a preliminary Philosophy of Operations for technology transfer at the DOE. Key elements include:

- A statement of purpose for technology transfer at the DOE.
- A list of objectives for improving the overall process.
- A description of the roles and responsibilities of DOE Headquarters, the program offices, the Operations Offices, and the laboratories.
- A statement of criteria for evaluating various strategies and tactics that will support the technology transfer objectives.

This philosophy represents a Department-wide vision of technology transfer as an important DOE mission. The philosophy seeks to achieve an appropriate balance between the needs of the laboratory contractors and third-party participants for increased speed, flexibility and predictability and the needs of the DOE for maintaining proper oversight of the technology transfer process.

Contract Modifications

The legislation requires that "not later than 150 days after the date of enactment of this Act, each agency which has contracted with a non-Federal entity to operate a Government-owned laboratory shall propose for inclusion in that laboratory's operating contract, to the extent not already included, appropriate contract provisions" to accomplish the technology transfer mission specified in the Act. For DOE, this involves proposing modifications to 18 contractors operating 21 different laboratory facilities (Appendix B).

While each of the existing contracts contains provisions related to different elements of the Department's technology transfer program, none of these contracts establishes the comprehensive technology transfer mission responsibility of the laboratory. Consequently, the Department has developed a proposed contract clause (Appendix C) that is self-contained and covers a wide range of technology transfer issues. Some of the more important features of the clause are that it:

- Clearly makes technology transfer an overall laboratory mission.
- Allows the contractor to use a portion of its R&D budget for a wide range of technology transfer activities.
- Addresses requirements for handling classified, sensitive, and export controlled technologies.
- Establishes guidelines for avoiding conflicts of interest and for preparing statements certifying same.
- Requires accounting procedures for the accrual and use of royalties or other technology transfer income.
- Authorizes the laboratory to form cost-shared, cooperative research and development agreements (CRADAs) with third parties.
- Allows the contractor to restrict dissemination for up to 5 years of data that has potential commercial value as defined in the NCTTA.
- Addresses the principles of U.S. competitiveness and fairness of opportunity, including consideration for small businesses.
- Establishes clear record keeping and oversight responsibilities.

We believe that the clause meets the requirements of the legislation and is consistent with the preliminary Philosophy of Operations that is being developed in cooperation with the laboratories and contractors. It provides increased flexibility to the laboratories and improves the speed and certainty of the technology transfer process. At the same time, it strengthens DOE oversight of the process.

While we expect some revisions to be made as we complete the negotiations with each contractor, our goal is to maintain a high degree of consistency in the contract clause among different contractors and laboratories. Based on input we have received from industry, such consistency is necessary in order to improve the predictability of working with DOE laboratories.

CRADAs and Joint Work Statements

In addition to making technology transfer a mission of all DOE laboratories, the NCTTA authorizes the GOCO laboratories to use a technology transfer mechanism, the cooperative research and development agreement (CRADA). The NCTTA also specifies some of the procedural requirements for using the new business instrument, including:

- The DOE must develop one or more model CRADAs for use by the laboratories to streamline the administrative process.
- The DOE must also develop procedures for reviewing (within 90 days after submission) Joint Work Statements (JWSs), which outline the scope of a proposed CRADA and which assign rights among the participating parties.
- Once a JWS has been approved, the contractor can proceed with negotiating the CRADA.
- Finally, once the negotiated CRADA is presented to DOE for approval, the DOE must respond to the laboratory within 30 days or report to Congress on its reasons for failure to respond.

Although the legislation did not link these requirements to a specific legislative deadline, the TTPG and TTFTF have already developed a model agreement and many of the corresponding procedures. These were reviewed in draft form at an Industry Workshop in Albuquerque, New Mexico on April 26, 1990. At the time the contract modifications are executed, this new instrument will be available for immediate use by the laboratories and the DOE operations offices. The model CRADA and supporting procedures represent a significant step forward in terms of simplicity and predictability, improving further on the Department's highly successful High Temperature Superconductivity Pilot Center Program.

Supporting Policies and Procedures

During Phase II, the TTPG and TTFTF identified several policies and procedures that need to be developed or revised. To support the provisions of the contract clause, policy guidance is being drafted for ensuring fairness of opportunity, encouraging small business and non-profit participation, conducting patent and licensing activities, and measuring and reporting performance.

We are also working on other policy instruments that will support the CRADA mechanism, including:

- Class patent waivers for the For-Profit contractors, for CRADAs and for other activities. Currently, these contractors must request waivers on a case-by-case basis.
- Modifications to DOE policy on the Freedom of Information Act (FOIA) to enhance implementation of Technology Transfer at DOE.
- Definition of activities that can be undertaken by the laboratories to increase the readiness for the transfer, to industry or others, of technologies developed for non-industrial purposes.
- Clarification of policies for waiving advance payments and full-cost recovery requirements, particularly for small business and non-profit participants in a CRADA.

Each of these policies and instruments is being developed in consultation with personnel from the Operations Offices, the contractors and the laboratories.

Other Benefits

Technology transfer is a dynamic process that is often referred to as a "contact sport." One of the important outcomes of the implementation process has been a significant increase in intra-departmental communication and interaction. All Program Offices, Operations Offices, and GOCO laboratories have worked together to look beyond their differences and find workable solutions to common problems.

These important cultural changes did not stop within the walls of DOE facilities. We have established a foundation of increased interaction and communication with industry, States, and universities. We have also opened up new avenues for increased inter-governmental cooperation with other agencies and Members of Congress.

These changes are fragile, however, and will need to be nurtured over the coming months and years. We are convinced that we need to develop and sustain an environment of teamwork, open communication and trust among all participants in the DOE technology transfer process. Only in this way, can we learn from our combined experiences and continue to improve technology transfer in response to changing national circumstances.

Completing the Implementation

Contract Negotiations

Negotiations between DOE and its contractors are underway at this time. We expect to complete the negotiations with the laboratory contractors by September 1, 1990.

Phase III: Implementation Teams

Phase III will last approximately 6 months and will continue the efforts begun in Phase II. This phase includes structuring the necessary guidelines and procedures for use by all participants. The procedures are aimed at efficiently and effectively transferring DOE technology to the U.S. private sector in a manner that is flexible, timely, and predictable.

Phase III will be led by the TTFTF with guidance from the TTPG. At least four teams will be formed and patterned after the team concept used so successfully in Phase II. The four teams identified to date will focus on:

- Developing and implementing detailed procedures for DOE field office processing of JWSs and CRADAs.
- Developing training programs for DOE and laboratory personnel and preparing a DOE Handbook for Technology Transfer.
- Developing outreach and liaison activities to interact more effectively with industry, States, and universities.
- Examining issues related to the participation of other DOE facilities (i.e. production facilities) in technology transfer and encouraging such participation.

In addition, each laboratory will be developing the procedures necessary to implement the technology transfer mission at their sites, consistent with the contract clause and supporting policy guidance as well as management oversight mechanisms.

The CRADA Process

The DOE laboratories will be able to begin using CRADAs as soon as their respective contracts have been modified. The major policies and procedures that are required to begin the process are already in place. GOCO laboratories are reporting a significant level of interest on the part of industry, States, and universities in technology transfer and the CRADA process. Because the draft instruments have been available since the end of March, some laboratories have already started discussing Joint Work Statements with third-party participants. These early efforts will be coordinated in parallel with the other Phase III implementation activities.

Technology Transfer and The National Energy Strategy

Concurrent with the NCTTA implementation, the Department has been developing the National Energy Strategy (NES). One of the important components of that strategy is technology transfer. The public input received to date (as compiled in the Interim Report, released on April 2, 1990) has been used extensively during the NCTTA implementation process to shape the preliminary Philosophy of Operations and identify options for overcoming barriers to technology transfer.

There are many routes for successful technology transfer at the DOE and its laboratories. In addition to the CRADA process, other activities include user facility and work-for-others agreements, direct contracting and cost-shared research, licensing and technology spin-off activities, personnel exchanges and consulting, and a host of information dissemination activities. A speedy review process will be developed to avoid risks to national security due to developmental activities co-located in facilities performing classified work.

During the coming months, members of the TTPG and TTFTF will also be involved in analyzing these other technology transfer mechanisms as input to the NES process. As highlighted in the public record, the DOE will be able to draw on the experience of several successful models for technology transfer, including the High Temperature Superconductivity Pilot Centers, the Clean Coal Technologies Program, the Small Business Innovations Research Program, the Energy Conservation Technology Utilization Program, the DOE user facilities, and work-for-others agreements.

We believe that our continued NCTTA implementation activities will help us strengthen and streamline these other mechanisms. These efforts will have a lasting and beneficial effect on all forms of partnerships between DOE, its laboratories, industry, States, and universities. Our goal is to develop a comprehensive, integrated technology transfer strategy for the Department of Energy and its partners that will contribute significantly to U.S. industrial competitiveness.

Appendix A.1

TECHNOLOGY TRANSFER PROJECT GROUP MEMBERSHIP

NAME	DOE ORGANIZATION
Alleva, John	Administration & Human Resources
Berniklau, Vic	Albuquerque Operations Office
Bresee, James C.	Civilian Radioactive Waste Management
Chacon, Doloros	Administration & Human Resources
Claflin, Alan	Energy Research
Conner, Carl	Civilian Radioactive Waste Management
Constant, Dick	General Counsel
Crane, William	General Counsel
Forsythe, Larry	Nuclear Energy
Frank, Clyde	Environmental Restoration & Waste Mgt.
Frye, Keith N.	Fossil Energy
Hnatio, John	Defense Programs
Jaffe, Harold	International Affairs & Energy Emergencies
Joseph, Toni	Energy Research
Kerrigan, Mark (Chairman)	Policy, Planning and Analysis
Kessler, Ron	Conservation and Renewable Energy
Langenfeld, Cherri (Deputy Chairman)	Policy, Planning and Analysis
Lee, Elmer	Administration and Human Resources
Mitchell, Howard	Procurement
Moore, K.G.	Conservation and Renewable Energy
Mournighan, Steve	Procurement
Oakley, Don	Environmental Restoration & Waste Mgt.
San Martin, Robert	Conservation and Renewable Energy
Sewell, Phil	Nuclear Energy
Shapiro, Michael	New Production Reactors
Siebert, Bryan	Defense Programs
Tarro, Jim	Administration and Human Resources
Weber, Yvonne	Environment, Safety & Health
Williamson, Richard	International Affairs & Energy Emergencies
Williams, Russ	Nuclear Energy

Appendix A.2

TECHNOLOGY TRANSFER FIELD TASK FORCE MEMBERSHIP

NAME	ORGANIZATION
Acanfora, Joe Lawrence	Lawrence Berkeley Laboratory
Adcock, Larry (Coordinator)	DOE/Albuquerque Operations Office
Ancona, Dan	DOE/Conservation & Renewable Energy
Arviza, Dan	Sandia National Laboratories
Bandy, Darrell	DOE/Albuquerque Operations Office
Barks, Ron	Los Alamos National Laboratory
Baron, Sy	Brookhaven National Laboratory
Bernard, Pete	DOE/San Francisco Operations Office
Berniklau, Vic (Chairman)	DOE/Albuquerque Operations Office
Boyd-Obarski, Rebecca	DOE/Chicago Operations Office
Buffer, A. L. "Bud"	Lamb and Associates
Carrigan, Richard	Fermi National Accelerator Laboratory
Chafin, Jim	DOE/Albuquerque Operations Office
Churm, Arthur	Argonne National Laboratory
Clement, Marv	Pacific Northwest Laboratory
Corey, Jack	Westinghouse Savannah River Company
Dalton, Roberta	DOE/Chicago Operations Office
DeGarmo, William	Lawrence Livermore National Laboratory
Downey, Kay	DOE/Pittsburgh Energy Technology Center
Faul, Jerry	DOE/Pinellas Area Office
Fisher, Bob	DOE/Chicago Operations Office
Fletcher, James	DOE/Chicago Operations Office
Freese, Ken	Los Alamos National Laboratory
Frost, Brian	Argonne National Laboratory
Kearns, Paul	DOE/SERI Area Office
Garcia, Jody	DOE/Albuquerque Operations Office
Giarrante, Gordon	DOE/Chicago Operations Office
Goldman, Dave	DOE/Chicago Operations Office
Gottlieb, Paul	DOE/Chicago Operations Office
Graham, Gordon	Sandia National Laboratories
Hagengruber, Don	Oak Ridge Associated Universities
Hamil, Roy	Sandia National Laboratories
Hanley, Jim	DOE/San Francisco Operations Office
Hodges, Tom	DOE/Richland Operations Office
Hightower, Jud	DOE/General Counsel
Hodge, Margaret (Team Support)	DOE/Albuquerque Operations Office
Kornreich, Don	Solar Energy Research Institute (SERI)
Kurkowski, Ted	DOE/Conservation & Renewable Energy
Langenfeld, Cherri (Liaison TTPG)	DOE/Policy, Planning and Analysis
Lee, Joe	DOE/Idaho Operations Office
Longerbeam, Gordon	Lawrence Livermore National Laboratory
Majumdar, Debu	DOE/Idaho Operations Office
Maldonado, Gil (Team Support)	DOE/Albuquerque Operations Office

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Page 2

Monhart, Jane	DOE/Brookhaven Area Office
Mock, Ted	DOE/Conservation & Renewable Energy
Moran, H. Dana	Solar Energy Research Institute
Mravca, Andrew	DOE/Batavia Area Office
Mullen, John	Continuous Electron Beam Accelerator Facility
Nesteruk, Harry	Martin Marietta Energy Systems
Norte, Jeanette (Team Support)	DOE/Albuquerque Operations Office
Olentine, Chuck	DOE/Fossil Energy
Pietri, Charles (Team Support)	DOE/Chicago Operations Office
Poteat, Bob	Oak Ridge National Laboratory
Radosevich, Ray (Consultant)	DOE/Albuquerque Ops. Office & Univeristy of NM
Rea, Tim	DOE/San Francisco Area Office
Richardson, Ken	Solar Energy Research Institute
Ross, Pepi	Lawrence Berkeley Laboratory
Scott, Mary Ann	DOE/Chicago Operations Office
Seeborn, Charlie	DOE/Morgantown Energy Technology Center
Siemans, Warren	Martin Marietta Energy Systems
Sink, Claire	DOE/Energy Research
Soderstrom, Jon	Martin Marietta Energy Systems
Streier, Jerry	DOE/Idaho Operations Office
Szenasi, Jim (Deputy Chairman)	DOE/Albuquerque Operations Office
Umbarger, John (Liaison TTPG)	Los Alamos National Laboratory
Van Domelen, Bruce	Sandia National Laboratories
Voytko, Jim	Sandia National Laboratories
Wagner, Allen	University of California at Berkeley
Williams, Dan	Ames Laboratory
Williams, Don	Pacific Northwest Laboratory
Wilson, John	DOE/Morgantown Energy Technology Center
Winchell, Bruce	Martin Marietta Energy Systems

Appendix A.3

GUEST SPEAKERS AT TTPG MEETINGS

NAME	ORGANIZATION
Allen, Joe	Department of Commerce
Appler, David	Department of Defense
Arvizu, Dan	Sandia National Laboratories
Ault, Len	NASA
Barish, Sam	DOE/Energy Research
Barks, Ron	Los Alamos National Laboratory
Bennethum, Gary	OMB
Blume, Marty	Brookhaven National Laboratory
Bush, Andy	Legislative Aide, Office of Senator Domenici
Chen, Phillip	National Institute of Health
Forsythe, Larry	DOE/Nuclear Energy
Joseph, Larry	DOE/Fossil Energy
Koomanoff, Fred	DOE/Energy Research
Mead, Ed	E. I. Dupont de Numours & Company
Mournighan, Steve	DOE/Procurement
San Martin, Bob	DOE/Conservation and Renewable Energy
Santiago, Hank	DOE/International Affairs & Energy Emergencies
Szenasi, Jim	DOE/Albuquerque Operations Office
Tallent, Bill	USDA
Turner, Jim	U.S. House Staff, Committee on Science and Technology
Uthus, Doug	DOE/Fossil Energy
Von Bargan, Patrick	Chief of Staff, Office of Senator Bingaman
Walaumont, John	IBM
Zanner, Frank	Sandia National Laboratories

Appendix A.4

TECHNOLOGY TRANSFER ROUND TABLE PARTICIPANTS

MARCH 7, 1990

Department of Energy

Secretary Watkins

Deputy Secretary Moore

Linda Stuntz
Deputy Secretary for Policy, Planning, and Analysis

Steve Wakefield
General Counsel

Other Administration

Secretary Mosbacher Department of Commerce

Judith Bostock
Special Assistant to the Director
Office of Science and Technology Policy

Congress

Senator Pete Domenici

Senator Jeff Bingaman

National Laboratories

Alan Schriesheim
Director, Argonne National Laboratory

Universities

John Deutch
Provost, MIT

States

Charles Guinn
Deputy Commissioner for Policy Analysis and Planning, NY State Energy Office

Industry

John Corsi
President, Solarex Corporation

Dan Dreyfus
VP, Strategic Planning, Gas Research Institute

Patrick Flynn
VP, Research and Technology, Cummins Engine Co.

Hugh Guthrie
Director, Extraction Projects Management Division, Morgantown Energy Technology Center

Milton Klein
VP (ret.), Electric Power Research Inst.

Roger Little
President, Spire Corporation

Richard T. McKernan
President, Packard Instruments; Senior Vice President, Canberra Industries

Ed Mead
Manager, Business Development, DuPont Co.

Edward Miller
President, National Center for Manufacturing Sciences

William Owczarski
Director, External Technology Development, United Technologies Corp.

Gary L. Seawright
Past President and CEO, Amtech Corp.

Chester Szymanski
President and CEO, Unilever Research United States

Gregory Yurek
President and CEO, American Superconductor Corporation

Appendix A.5

ATTENDEES AT THE CHICAGO ALL-HANDS MEETING
MARCH 28-29, 1990

NAME	ORGANIZATION
Acanfora, Joe	Lawrence Berkeley Laboratory
Adcock, Larry	DOE/Albuquerque Operations Office
Albrecht, John M.	DOE/Chicago Operations Office
Alleva, John	DOE/Administration & Human Resources
Ancona, Dan	DOE/Conservation & Renewable Energy
Arvizu, Dan	Sandia National Laboratories
Bandy, Darrell	DOE/Albuquerque Operations Office
Barks, Ron	Los Alamos National Laboratory
Barrack, Irv	DOE/Oak Ridge Operations Office
Bernard, Pete	DOE/San Francisco Operations Office
Berniklau, Vic	DOE/Albuquerque Operations Office
Blair, Larry	Los Alamos National Laboratory
Bogosian, Peg	DOE/Brookhaven Area Office
Boyd-Obarski, Rebecca	DOE/Chicago Operations Office
Braun, Japnell	EG&G Intertech, Inc.
Buffer, Bud	DOE/Albuquerque Operations Office
Burr, Ralph	DOE/Conservation & Renewable Energy
Carrigan, Richard	Fermi National Accelerator Laboratory
Chafin, Jim	DOE/Albuquerque Operations Office
Churm, Arthur	Argonne National Laboratory
Claflin, Alan	DOE/Energy Research
Clement, Marv	Pacific Northwest Laboratory
Constant, Dick	DOE/General Counsel
Corey, Jack	Westinghouse Savannah River Company
Crane, William	DOE/General Counsel
Dalton, Roberta	DOE/Chicago Operations Office
DeGarmo, William	Lawrence Livermore National Laboratory
Downey, Kay	DOE/Pittsburgh Energy Technology Center
Eckard, Royce	Lawrence Livermore National Laboratory
Faul, Jerry	DOE/Pinellas Area Office
Fisher, Bob	DOE/Chicago Operations Office
Fletcher, James	DOE/Chicago Operations Office
Forsythe, Larry	DOE/Nuclear Energy
Freese, Ken	Los Alamos National Laboratory
Freund,Sam	Los Alamos National Laboratory
Frost, Brian	Argonne National Laboratory
Garcia, Jody	DOE/Albuquerque Operations Office
Giarrante, Gordon	DOE/Chicago Operations Office
Goldman, Dave	DOE/Chicago Operations Office
Gottlieb, Paul	DOE/Chicago Operations Office
Graham, Gordon	Sandia National Laboratories
Hamil, Roy	Sandia National Laboratories
Hanley, Jim	DOE/San Francisco Operations Office
Hickman, David	Martin Marietta Energy Systems
Hightower, Jud	DOE/General Counsel
Hnatio, John	DOE/Defense Programs
Holman, Richard	Idaho National Engineering Laboratory
Hooker, Gerald J.	Westinghouse Savannah River Company
Joseph, Toni	DOE/Energy Research

Kearns, Paul	DOE/SERI Area Office
Kessler, Bob	Allied-Signal Aerospace Company
Kornreich, Don	Solar Energy Research Institute
Kurkowski, Ted	DOE/Conservation & Renewable Energy
Langenfeld, Cherri	DOE/Policy, Planning and Analysis
Lee, Joe	DOE/Idaho Operations Office
Lenhert, Jeff	DOE/Albuquerque Operations Office
Longerbeam, Gordon	Lawrence Livermore National Laboratory
Maldonado, Gil	DOE/Albuquerque Operations Office
McBride, Curtis	DOE/Pittsburgh Energy Technology Center
Moran, H. Dana	Solar Energy Research Institute
Mournighan, Stephen	DOE/Procurement
Mravca, Andrew	DOE/Batavia Area Office
Norte, Jeanette	DOE/Albuquerque Operations Office
Olenchock, Marcia	DOE/Morgantown Energy Technology Center
Olentine, Chuck	DOE/Assistant Secretary for Fossil Energy
Olivier, Joe	DOE/Defense Programs
Olsen, Kurt	Sandia National Laboratory
Pietri, Charles	DOE/Chicago Operations Office
Poteat, Bob	Oak Ridge National Laboratory
Radosevich, Ray	DOE/Albuquerque Operations Office
Rea, Tim	DOE/San Francisco Area Office
Repici, Dominic	DOE/Albuquerque Operations Office
Richardson, Ken	Solar Energy Research Institute
Santori, Henry	Lawrence Livermore National Laboratory
Scott, Mary Ann	DOE/Chicago Operations Office
Scott, Don	DOE/Savannah Rivers Operations Office
Siemans, Warren	Martin Marietta Energy Systems
Sink, Claire	DOE/Energy Research
Smith, Brad	EG&G Intertech, Inc.
Soderstrom, Jon	Martin Marietta Energy Systems
Southworth, Robert	DOE/Richland Operations Office
Streier, Jerry	DOE/Idaho Operations Office
Szenasi, Jim	DOE/Albuquerque Operations Office
Thielbahr, Bill	DOE/Idaho Operations Office
Umbarger, John	Los Alamos National Laboratory
Van Domelen, Bruce	Sandia National Laboratories
Voytko, Jim	Sandia National Laboratories
Westphal, Dave	EG&G Intertech, Inc.
Williams, Russell	DOE/Nuclear Energy
Williams, L. Donald	Pacific Northwest Laboratory
Williams, Dan	Ames Laboratory
Wilson, John	DOE/Morgantown Energy Technology Center
Winchell, Bruce	Martin Marietta Energy Systems

Appendix A.6

ALBUQUERQUE INDUSTRY WORKSHOP PARTICIPANTS - INDUSTRY, UNIVERSITIES and STATE AND LOCAL GOVERNMENT

APRIL 26, 1990

NAME	ORGANIZATION
Alhorn, Leland	BDM International, Inc.
Baer, Thomas	U.S. Ecology
Bernard, Chuck	Carlsbad Department of Development
Bhada, Ron	New Mexico State University
Bieri, Mike	Pajarito Sciences
Blake, Sara	Arizona Technology Development Corp.
Blumeyer, Max	Sorrento Electronics
Buddecke, Martha	Johnson & Johnson
Bullington, Jeff	Radiant Technologies
Busch, Michael	Lujan Software Services
Cole, Allan	Maxwell Laboratories, Inc.
Cox, Morgan	Eberline Instrument Corporation
Cutler, Leonard	Hewlett-Packard Superconductivity Lab
Darnall, Dennis	Bio-Recovery Systems, Inc.
Decalo, Marilyn	University of Colorado at Boulder
Dendahl, John	New Mexico Economic Development & Tourism Dept.
Dietrich, Dean	National Center for Manufacturing Sciences
Dilworth, George	Technical Resources International
Dobbins, Cheryl	Basic Technologies International
Emmerling, Robert	Allied Signal Aerospace
Ferrarraccio, Ponzi	New Mexico Research & Development Institute
Floegel, Jack	Perma Charge Corporation
Forsen, Harold	Bechtel Group, Inc.
Frost, Lyman	Babcock & Wilcox
Gerhart, John	Senator Jeff Bingaman's Office
Goldman, Leonard	Bechtel National, Inc.
Gore, Gerald	Public Service Electric & Gas Co.
Habiger, Kerry	Titan Spectrum
Hamm, Robert	Accsys Technology, Inc.
Hock, Richmond	Sandvick Special Metals Corporation
Hodges, Harry	TRW Space & Technology Group
Hughes, George	EG&G Intertech, Inc.
Jensen, Robert	De Vore Aviation Corporation
Johnson, Brian	Gas Research Institute
Jones, David	Jomar Systems
Lemons, Richard	Knight Architects Engineers Planners, Inc.
Lenling, William	Fisher-Barton, Inc.
Leonard, Anthony	The Leonard Company
Lujan, Celso	Lujan Software Services

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Macon, Dick	National Center for Manufacturing Sciences
Macy, Ray	Gardner, Mason & Assoc., Inc.
Masucci, Lisa	U O P, Incorporated
McFarren, Bob	Stone & Webster Eng. Corp.
McKinley, Jackie	New Mexico Economic Development & Tourism Dept.
McNamara, Ioanna	Perma Charge Corporation
Meissner, Helmuth	Hoya Optics, Inc.
Mikoryak, David	Transportation Mfg. Corp.
Moye, Bill	New Mexico Business Inovation Center
Nathanson, Jeff	New Mexico Business Inovation Center
Osborne, Denise	NRT Corporation
Reinig, Phil	Los Alamos Technical Associates
Rus, David	Public Service Co. of New Mexico
Rutledge, Jim	Sematech
Seawright, Gary	Zotron
Sheehan, Jim	Gulton Data Systems
Smith, Gary	University of New Mexico
Snedeker, David	British Nuclear Fuels
Solimon, Ron	Laguna Industries, Inc.
Sopp, Al	University of New Mexico
Thornhill, Tom	New Mexico Technet
Wahi, Krishan	Gram, Inc.
Wallk, Hilory	Gas Research Institute
Walukas, Donald	National Center for Manufacturing Sciences
Warford, David	Transportation Motor Corporation
Weber, Hans	Science Applications International Corp.
Weiss, David	Caterpillar, Inc.
Wilkey, Richard	Fisher-Barton, Inc.
Woolery, Geof	Mobil Research & Development Corp.
Zamora, Paul	Biotechnology Resources
Zuniga, Ricardo	Senator Jeff Bingaman's Office

ALBUQUERQUE INDUSTRY WORKSHOP
PARTICIPANTS - DOE and CONTRACTORS

APRIL 26, 1990

NAME	ORGANIZATION
Adcock, Larry	DOE/Albuquerque Operations Office
Arvizu, Dan	Sandia National Laboratory
Berniklau, V.V.	DOE/Albuquerque Operations Office
Buffer, Bud	DOE/Albuquerque Operations Office
Chafin, Jim	DOE/Albuquerque Operations Office
Clement, Marv	Pacific Northwest Laboratory
Foruwall, Mark	DOE/Office of Scientific and Technical Information
Forsythe, Larry	DOE/Nuclear Energy
Freese, Ken	Los Alamos National Laboratory
Goldman, Dave	DOE/Chicago Operations Office
Gonzales, David	DOE/Office of Inspector General
Gover, James	Sandia National Laboratories
Graham, Gordon	Sandia National Laboratories
Hamil, Roy	Sandia National Laboratories
Hodge, Margaret	DOE/Albuquerque Operations Office
Jiron, George	DOE/Office of Inspector General
Langenfeld, Cherri	DOE/Policy, Planning and Analysis
Manthey, George	Oak Ridge National Laboratory
Mikel, Cathy	Westinghouse Isolation Pilot Plant Division
Norte, Jeanette	DOE/Albuquerque Operations Office
Noun, Robert	Solar Energy Research Institute
Olivier, Joseph	DOE/Defense Programs
Olson, Kurt	Sandia National Laboratories
Poteat, Bob	Oak Ridge National Laboratory
Radosevich, Ray	DOE/Albuquerque Ops. Office and University of NM
Rea, Tim	DOE/San Francisco Operations Office
Rohrl, Don	Sandia National Laboratories
Salzano, Frank	Brookhaven National Laboratory
Soderstrom, Jon	Martin Marietta Energy Systems
Stark, Eugene	Los Alamos National Laboratory
Szenasi, Jim	DOE/Albuquerque Operations Office
Umbarger, John	Los Alamos National Laboratory
Varnado, Sam	Los Alamos National Laboratory
Voytko, Jim	Sandia National Laboratories
Walls, Jim	Westinghouse Isolation Pilot Plant Division
Williams, Dan	Ames Laboratory
Yonas, Gerold	Sandia National Laboratories

Appendix B

RECIPIENTS OF
CONTRACT MODIFICATION CLAUSE

DOE FIELD OFFICE	LABORATORY	CONTRACTOR
Albuquerque	Sandia National Laboratories	AT&T Technologies, Inc.
Albuquerque	Lovelace Bio. & Env. Research Inst.	Lovelace Medical Foundation.
Albuquerque	Los Alamos National Laboratory	University of California
Chicago	Ames Laboratory	Iowa State University
Chicago	Argonne National Laboratory	University of Chicago
Chicago	Princeton Plasma Physics Laboratory	Princeton University
Chicago	Solar Energy Research Institute	Midwest Research Institute
Chicago	Superconducting Supercollider Laboratory	Universities Research Assoc., Inc.
Chicago	Fermi National Accelerator Laboratory	Universities Research Assoc., Inc.
Chicago	Brookhaven National Laboratory	Associated Universities, Inc.
Idaho	Idaho National Engineering Laboratory	EG & G Idaho, Inc.
Oak Ridge	Tng. Hosp./Museum/Inst. Eng. Anal.	Oak Ridge Assoc. Universities
Oak Ridge	Oak Ridge National Laboratory	Martin Marietta Energy Systems
Oak Ridge	Continuous Electron Beam Accelerator Facility	South University Assoc.
Richland	Operation & Engineering Services	Westinghouse Hanford Co.
Richland	Pacific Northwest Laboratory	Battelle Memorial Institute
San Francisco	Energy Tech. Engr. Center	Rockwell International Corp.
San Francisco	Stanford Linear Accelerator	Stanford University
San Francisco	Lawrence Livermore National Laboratory	University of California
San Francisco	Lawrence Berkeley Laboratory	University of California
Savannah River	Savannah River Laboratory	Westinghouse

April 27, 1990

Appendix C

TECHNOLOGY TRANSFER CONTRACT CLAUSE

This clause has as its purpose, implementation of the National Competitiveness Technology Transfer Act of 1989 (Sections 3131, 3132, 3133, and 3159 of P.L. 101-189) and takes precedence over any other provisions of this Contract to the contrary.

I. TECHNOLOGY TRANSFER

A. Definitions

1. Contractor's Laboratory Director means the individual who has supervision over all or substantially all of the Contractor's operations at the Laboratory.

2. Intellectual Property means patents, trademarks, copyrights, mask works, and other forms of comparable property rights protected by Federal Law.

3. Cooperative Research and Development Agreements (CRADAs) mean any agreement entered into between one or more Federal laboratories and one or more non-Federal parties under which the Government, through its laboratories, provides personnel, services, facilities, equipment, and other resources with or without reimbursement (but not funds to non-Federal parties) and the non-Federal parties provide funds, personnel, services, facilities, equipment, or other resources toward the conduct of specified research or development efforts which are consistent with the missions of the Laboratory; except that such term does not include a procurement contract or cooperative agreement as those terms are used in sections 6303, 6304, and 6305 of Title 31 of the United States Code.

4. Joint Work Statement (JWS) means a proposal for a CRADA prepared by the Contractor, signed by the Contractor's Laboratory Director which describes the following:

   a. Purpose;

   b. Scope of Work which delineates the rights and responsibilities of the Government, the Contractor and Third Parties, one of which must be a non-Federal party;

   c. Schedule for the work; and

   d. Cost and resource contributions of the parties associated with the work and the schedule.

B. Authority

1. In order to ensure the full use of the results of research and development efforts of, and the capabilities of, the Laboratory, technology transfer, including Cooperative Research and Development Agreements (CRADAs), is established as a mission of the Laboratory consistent with the policy, principles and purposes of Sections 11(a)(1) and 12(g) of the Stevenson-Wydler Technology Innovation Act of 1980 as amended (15 U.S.C. 3710a); Section 3132(b) of P.L. 101-189 and of Chapter 38 of the Patent Laws (35 U.S.C. 200 et seq.); Section 152 of the Atomic Energy Act of 1954 as amended (42 U.S.C. 2182); Section 9 of the Federal Non-Nuclear Act of 1974 (42 U.S.C. 5908); and Executive Order 12591 of April 10, 1987.

2. The Contractor shall conduct technology transfer activities with the clear intent of providing benefit from Federal research to U. S. industrial competitiveness.

3. In pursuing the technology transfer mission, the Contractor is empowered to conduct the following activities: identify and protect Intellectual Property, negotiate licensing agreements for Intellectual Property that the Contractor controls or owns, enter into CRADAs, provide technical consulting and personnel exchanges, conduct science education activities and reimbursed Work for Others (WFO), provide information exchanges and make available Laboratory user facilities. It is fully expected that the Contractor shall use all of the mechanisms available to them to accomplish this technology transfer mission, including, but not limited to, user facilities, WFO, science education activities, consulting, personnel exchanges, and licensing in accordance with this clause.

C. Allowable Costs (Applies to Contractors performing technology transfer activities under this clause and from which all income is returned to the Laboratory for use under the Contract.)

1. The Contractor shall establish and carry out its technology transfer efforts through appropriate organizational elements consistent with the requirements for an Office of Research and Technology Applications (ORTA) pursuant to Paragraphs (b) and (c) of Section 11 of the Stevenson-Wydler Technology Innovation Act of 1980 as amended (15 U.S.C. 3710). The costs associated with the conduct of technology transfer through the ORTA, including activities associated with obtaining, maintaining, and licensing Intellectual Property rights, increasing the potential for the transfer of technology, and the widespread notice of technology transfer opportunities, shall be deemed allowable provided that such costs meet the other requirements of the allowable costs provisions of this Contract. These costs in any fiscal year shall not exceed an amount equal to 0.5 percent

of the Federal research and development budget of the Laboratory for that fiscal year, without written approval of the Contracting Officer, in addition to any separately designated funds.

2. The Contractor's participation in litigation to enforce or defend Intellectual Property claims associated with its technology transfer efforts shall be as provided in the clause entitled "Litigation and Claims" of this Contract.

D. Conflicts of Interest - Technology Transfer

The Contractor shall develop implementing procedures that seek to avoid employee and organizational conflicts of interest, or the appearance of conflicts of interest, in the conduct of its technology transfer activities. Such implementing procedures shall be provided to the Contracting Officer for review and approval within sixty (60) days after execution of this clause. The Contracting Officer shall have thirty (30) days thereafter to approve or require specific changes to such procedures. Such implementing procedures shall include procedures to:

1. Ensure employee competency, conduct and integrity, in connection with the CRADA activity in accordance with the provisions of Paragraph II.E. of this clause.

2. Review and approve employee activities so as to avoid conflicts of interest arising from commercial utilization activities relating to Contractor-developed Intellectual Property;

3. Conduct work performed using royalties so as to avoid interference with or adverse effects on ongoing DOE projects and programs;

4. Conduct activities relating to commercial utilization of Contractor-developed Intellectual Property so as to avoid interference with or adverse effects on user facility or WFO activities of the Contractor;

5. Conduct DOE funded projects and programs so as to avoid the appearance of conflicts of interest or actual conflicts of interest with non-Government funded work;

6. Notify the Contracting Officer with respect to any new work to be performed or proposed to be performed under the Contract for the Department or other Federal agencies where the new work or proposal involves Intellectual Property in which the Contractor has obtained or intends to request or elect title;

7. Except as provided elsewhere in this Contract, obtain the approval of the Contracting Officer for any licensing of or assignment of title to Intellectual Property rights by the Contractor to any business or corporate affiliate of the Contractor;

8. Obtain the approval of the Contracting Officer prior to any assignment, exclusive licensing, or option for exclusive licensing, of Intellectual Property to any current or former Laboratory employee or consultant.

9. Notify non-Federal sponsors of WFO activities, or non-Federal users of user facilities, of any relevant Intellectual Property interest of the Contractor prior to execution of WFOs or user agreements.

E. Fairness of Opportunity

In conducting its technology transfer activities, the Contractor shall prepare procedures and take all reasonable measures to ensure widespread notice of availability of technologies suited for transfer and opportunities for exclusive licensing and joint research arrangements. The requirement to widely disseminate the availability of technology transfer opportunities does not apply to a specific application originated outside of the Laboratory.

F. U.S. Industrial Competitiveness

1. In the interest of enhancing U.S. Industrial Competitiveness, the Contractor shall, in its licensing and assignments of Intellectual Property, give preference in such a manner as to enhance the accrual of economic and technological benefits to the U.S. domestic economy. The Contractor shall consider the following factors in all of its licensing and assignment decisions:

   (a) whether any resulting design and development will be performed in the United States and whether resulting products, embodying parts, including components thereof, will be substantially manufactured in the United States; or

   (b) whether the proposed licensee or assignee has a business unit located in the United States and whether significant economic and technical benefits will flow to the United States as a result of the license or assignment agreement; and further,

   (c) whether in licensing any entity subject to the control of a foreign company or government, such foreign government permits United States agencies, organizations or other persons to enter into cooperative research and development agreements and licensing agreements, and have policies to protect United States intellectual property rights.

   If the Contractor determines that neither of the above two sets of conditions is likely to be fulfilled, the Contractor, prior to entering into such an agreement, must obtain the approval of the Contracting Officer. The Contracting Officer shall act on any such requests for approval within thirty (30) days.

2. The Contractor agrees to be bound by the provisions of 35 U.S.C. 204 regardless of Contractor size or nonprofit status or the nature of the agreement.

G. Indemnity - Product Liability

In conducting technology transfer activities, including but not limited to, licensing activities or CRADAs, the Contractor agrees to include in such agreements a requirement to indemnify itself and the U.S. Government for all damages, costs, and expenses, including attorneys' fees, arising from the commercialization and utilization of such technologies, including, but not limited to, the making, using, selling or exporting of products, processes, or services derived from the transferred technology.

H. Disposition of Income (Applies to Contractors conducting technology transfer activities under this clause and from which all income is returned to the Laboratory for use under the Contract.)

1. Royalties or other income earned or retained by the Contractor as a result of performance of authorized technology transfer activities herein shall be used by the Contractor for scientific research, development and education at the Laboratory, consistent with the research and development mission and objectives of the Laboratory and subject to Section 12(b)(5) of The Stevenson-Wydler Technology Innovation Act of 1980, as amended (15 U.S.C. 3710a(b)(5)) and Chapter 38 of the Patent Laws (35 U.S.C. 200 et seq.) as amended through *[insert the date of this modification]*. If the amounts of such royalties and income received during any fiscal year exceed 5 percent of the Laboratory's budget for that fiscal year, 75 percent of such excess amounts shall be paid to the Treasury of the United States, and the remaining amount of such excess shall be used by the Contractor for the purposes as described above in this paragraph. Any inventions arising out of such scientific research and development activities shall be deemed to be "Subject Inventions" under the Contract.

2. The Contractor shall include as a part of its annual Laboratory Institutional Plan or other such annual document a plan setting out those uses to which royalties and other income received as a result of performance of authorized technology transfer activities herein, will be applied at the Laboratory, and at the end of the year, provide a separate accounting for how the funds were actually used. Under no circumstances shall these royalties and income be used for an illegal augmentation of funds furnished by the U.S. Government.

3. The Contractor shall establish a policy for making awards or sharing of royalties with Contractor employees, including Fed-

eral employee coinventors when deemed appropriate by the Contracting Officer.

I. Transfer to Successor Contractor

In the event of termination or expiration of this Contract, any unexpended balance of income received for use at the Laboratory shall be transferred, at the Contracting Officer's request, to a successor contractor, or in the absence of a successor contractor, to such other entity as designated by the Contracting Officer. The Contractor shall transfer title, as one package, in all patents and patent applications, licenses, accounts containing royalty revenues from such license agreements, including equity positions in third party entities, and other Intellectual Property rights which arose at the Laboratory, to the successor contractor or to the Government as directed by the Contracting Officer.

J. Technology Transfer Affecting the National Security

1. The Contractor shall notify the Contracting Officer, prior to entering into any technology transfer arrangement, when such technology or any part of such technology is classified or sensitive under Section 148 of the Atomic Energy Act (42 U.S.C. 2168). Such notification shall include sufficient information to enable DOE to determine the extent that commercialization of such technology would enhance or diminish security interests of the United States, or diminish communications within DOE's nuclear weapons production complex. DOE shall use its best efforts to complete its determination within sixty (60) days of the Contractor's notification, and provision of any supporting information, and DOE shall promptly notify the Contractor as to whether the technology is transferable.

2. The Contractor shall include in all of its technology transfer agreements with third parties, including, but not limited to, CRADAs, licensing agreements and assignments, notice to such third parties that the export of goods and/or Technical Data from the United States may require some form of export control license from the U.S. Government and that, failure to obtain such export control license, may result in criminal liability under U.S. laws.

3. For other than fundamental research as defined in National Security Directive 189, the Contractor is responsible to conduct internal export control reviews and assure that technology is transferred, in accordance with applicable law.

K. Records

The Contractor shall maintain records of its technology transfer activities, in a manner and to the extent satisfactory to the DOE, and specifically including, but not limited to, the licensing agreements, assignments and the records required to implement the requirements of paragraphs E., F., and H., herein and shall provide reports to the Contracting Officer to enable DOE to maintain the recording requirements of Section 12(c)(6) of the Stevenson-Wydler Technology Innovation Act of 1980 as amended (15 U.S.C. 3710a(c)(6)). Such reports shall be made annually in a format to be agreed upon between the Contractor and the DOE and in such a format which will serve to adequately inform DOE of the Contractor's technology transfer activities while protecting any data not subject to disclosure under the Rights in Technical Data clause and Section II. herein. Such records shall be made available in accordance with the clauses of this Contract pertaining to inspection, audit and examination of records.

L. Reports to Congress

To facilitate DOE's reporting to Congress, the Contractor is required to annually submit to DOE a technology transfer plan for conducting its technology transfer function for the upcoming year, including plans for securing Intellectual Property rights in Laboratory innovations with commercial promise and plans for managing such innovations so as to benefit the competitiveness of United States industry. This plan shall be provided to the Contracting Officer on or before *[insert date]* of each year.

M. Oversight and Appraisal

The Contractor is responsible for developing and implementing effective internal controls for all technology transfer activities consistent with the audit and record requirements of this Contract. Laboratory Contractor performance in implementing the technology transfer mission and the effectiveness of Contractor procedures will be evaluated by the Contracting Officer as part of the annual appraisal process, with input from the cognizant Secretarial Officer or program office.

II. TECHNOLOGY TRANSFER THROUGH COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS

Upon approval of the Contracting Officer and as provided in a DOE approved Joint Work Statement (JWS), the Laboratory Director or his designee may enter into CRADAs on behalf of the DOE subject to the requirements set forth herein.

A. Review and Approval of CRADAs

1. Each JWS shall be submitted to the Contracting Officer for approval. The Contractor's Laboratory Director shall provide a program mission impact statement and shall include an impact statement regarding related known Intellectual Property rights owned by the Government to assist the Contracting Officer in his approval determination.

2. The Contractor shall also include (specific to the proposed CRADA), a statement of compliance with the Fairness of Opportunity requirements of paragraph I.E. above.

3. Within ninety (90) days after submission of a JWS, the Contracting Officer shall approve, disapprove or request modification to the JWS. If a modification is required, the Contracting Officer shall approve or disapprove any resubmission of the JWS within thirty (30) days of its resubmission, or ninety (90) days from the date of the original submission, whichever is later. The Contracting Officer shall provide an explanation to the Contractor's Laboratory Director of any disapproval or requirement for modification of a JWS.

4. Upon approval of a JWS, the Contractor's Laboratory Director may submit a CRADA, based upon the approved JWS, to the Contracting Officer. The Contracting Officer, within thirty (30) days of receipt of the CRADA, shall approve or request modification of the CRADA. If the Contracting Officer requests a modification of the CRADA, an explanation of such request shall be provided to the Laboratory Director.

5. The Contractor shall not enter into, or begin work on, a CRADA until approval of the CRADA has been granted by the Contracting Officer. The Contractor may submit its proposed CRADA to the Contracting Officer at the time of submitting its proposed JWS or any time thereafter. However, the Contracting Officer is not obligated to respond under subparagraph 4. above until within thirty (30) days after approval of the JWS or thirty (30) days after submittal of the CRADA, whichever is later.

B. Selection of Participants

The Contractor's Laboratory Director, in deciding what CRADA to enter into shall:

1. Give special consideration to small business firms, and consortia involving small business firms;

2. Grant U. S. preference in accordance with the licensing and assignment requirements of paragraph I.F. above;

3. Provide Fairness of Opportunity in accordance with the requirements of paragraph I.E. above; and

4. Give consideration to the Conflicts of Interest requirements of paragraph I.D. above.

C. Withholding of Data

1. The Contractor may provide for appropriate protection against dissemination of data produced as a result of research and development activities conducted under the CRADA, for a period of up to five (5) years from the time the data is first produced. Such data must be data that would be a trade secret or commercial or financial data that would be privileged or confidential, if such data had been obtained from a non-Federal Third Party. Since such data is exempt from disclosure under the Freedom of Information Act, the DOE shall cooperate with the Contractor in withholding such data.

2. In order to avoid duplication of effort, the Contractor agrees, at the request of the Contracting Officer, to transmit such data to other DOE facilities for use by DOE or its Contractors by or on behalf of the Government. Upon transmitting such data, the Contractor shall clearly mark the data with a legend setting out the restrictions against private use and further dissemination, along with the expiration date of such restrictions.

3. In addition to its authority to license Intellectual Property, the Contractor may enter into licensing agreements with third parties for data developed by the Contractor under a CRADA subject to other provisions of this Contract. However, the Contractor shall neither use the protection against dissemination nor the licensing of data as an alternative to obtaining patent protection of any invention contained in such data.

D. Work For Others and User Facility Programs

1. WFO and User Facility Agreements (UFAs) are not considered CRADAs and will be available for use by the Contractor in addition to CRADAs for achieving utilization of employee expertise and unique facilities for maximizing technology transfer. The Contractor agrees to inform prospective CRADA participants, which are intending to substantially pay full cost to recovery for the effort under the CRADA, of WFO and UFA opportunities, including Class Waiver provisions associated therewith.

2. Where the Contractor believes that the transfer of technology to the U. S. domestic economy will benefit from, or other equity considerations dictate, an arrangement other than the Class Waiver of patent rights to the sponsor in WFO and UFAs, a request may be made to the Contracting Officer for an exception to the Class Waivers.

E. Conflicts of Interest

1. Except as provided in paragraph 3. below, the Contractor shall assure that no employee of the Contractor shall have a substantial role (including an advisory role) in the preparation, negotiation, or approval of a CRADA, if, to such employee's knowledge:

   a. Such employee, or the spouse, child, parent, sibling, or partner of such employee, or an organization (other than the Contractor) in which such employee serves as an officer, director, trustee, partner, or employee--

      (1) holds financial interest in any entity, other than the Contractor, that has a substantial interest in the preparation, negotiation, or approval of the CRADA;

      (2) receives a gift or gratuity from any entity, other than the Contractor, that has a substantial interest in the preparation, negotiation, or approval of the CRADA; or

   b. A financial interest in any entity, other than the Contractor, that has a substantial interest in the preparation, negotiation, or approval of the CRADA, is held by any person or organization with whom such employee is negotiating or has any arrangement concerning prospective employment.

2. The Contractor shall require that each employee of the Contractor who has a substantial role (including an advisory role) in the preparation, negotiation, or approval of a CRADA certify to the Contracting Officer that the circumstances described in paragraph 1. above do not apply to that employee.

3. The requirements of paragraphs 1. and 2. above shall not apply in a case where an employee, described therein, advises the Contracting Officer in advance of his or her participation in the preparation, negotiation or approval of a CRADA of the nature of and extent of any financial interest described in paragraph 1., and the Contracting Officer determines that such financial interest is not so substantial as to be considered likely to affect the integrity of the Contractor employee's participation in the process of preparing, negotiating, or approving the cooperative agreement.

III. TECHNOLOGY TRANSFER IN OTHER COST SHARING AGREEMENTS

In conducting research and development activities in cost shared agreements not covered by Section II. above, the Contractor, with written permission of the Contracting Officer, may provide for the withholding of data produced thereunder in accordance with the applicable provisions of paragraph II.C. herein.

Mr. **Thornton**. Thank you very much for the summary of your testimony.

Mr. Adler.

Mr. **Adler**. Mr. Chairman, members of the subcommittee, the National Institutes of Health also is very pleased to have this opportunity to highlight our progress in implementing the FTTA.

My oral statement focuses on several key aspects of our programs as well as on two of our CRADA's. The new NIH director, Dr. Bernadine Healy, described the vital public interest context of scientific research at her Senate confirmation hearing in March, and she identified technology transfer as an essential ingredient to realizing the mission of NIH. She stressed that—and I quote—"The discoveries of the laboratory must be carried to the bedside, and the development of new drugs, devices, and diagnostic tests needs to be done in partnership with industry."

This partnership, however, must develop under carefully crafted guidelines to ensure that the fundamental mission of NIH is preserved and that industry, academic, and Government work together honorably to ensure the public's trust.

As enunciated in our 1989 policy statement on CRADA's, our fundamental mission is to conduct biomedical and behavioral research that will lead to better health for the American people. The FTTA has added the additional vital mission of technology transfer.

NIH CRADA's themselves reflect a very dynamic and synergistic collaborative research process. Many of the approved CRADAs, about 140 in number, provide resources and technological expertise that are vital to a project's success or to product development, but such resources often are unavailable to us in-house. Additionally, many of these CRADA projects facilitate a company's product development process at the earliest possible stage, and it proceeds in parallel with ongoing laboratory or clinical research.

Several exciting and extremely important CRADA's involve three NIH scientists: Dr. French Anderson and Dr. Arthur Nienhuis of our National Heart, Lung, and Blood Institute, and Dr. Michael Blaese of the National Cancer Institute—NCI—as well as a biotechnology company, Genetic Therapy, Inc. Their joint research efforts have led to the design and production of a system that is capable of genetically engineering—genetically modifying—an individual patient's own cells in order to introduce genes that produce enzymes for which the patient is deficient or that enhance their immune system's ability to fight cancer.

Clinical trials pursuant to this CRADA now under way at NIH have shown very promising, very encouraging results. These studies infuse back into patients cells grown and modified at the company by commercial processes that it has developed. Ongoing evaluation of the clinical data at NIH offers hope now for providing a functioning immune system for a nine-year-old girl who suffers from adenosine deaminase deficiency, a rare genetic disorder.

Other clinical efforts are attempting to treat cancer by enhancing the anti-tumor activity of lymphcytes that were unable in these patients to successfully fight the tumor's growth. If this mode of therapy proves effective, potential applications of the technology may treat other genetic disorders such as hemophilia, perhaps sickle cell anemia, or diseases such as AIDS or heart disease. We believe that the CRADA program has advanced development of this technology by several years.

The development of taxol, the highly promising treatment for ovarian, breast, and possibly lung cancer, has been identified as an emergency priority by NCI, and the CRADA mechanism is of critical importance in meeting this research challenge. Thus, the NCI CRADA between Dr. Dale Shoemaker and the Bristol Myers-Squibb Company involves the joint clinical evaluation of taxol in which our corporate research partner focuses much of its efforts on the development of synthetic or cell culture sources for producing this extremely rare compound in commercial quantities. At present, the only known source of taxol is the bark of the Pacific yew tree which is found in old growth forests in the Pacific Northwest, also the habitat of the spotted owl. In an effort toward protecting our natural resources, the NCI is also exploring alternative sources to obtain large quantities of the compound.

Many of our program activities relate to expanding the knowledge base and easing frustrations of our scientists with the details of technology transfer and, for example, in streamlining the overall invention reporting process. We are developing, as an example, an interactive, instructional, computer-based, training and invention reporting system.

Very important to our discharge of FTTA responsibilities includes within each of the NIH component institutes the activities of a designated technology development coordinator who is responsible for negotiating, monitoring, and processing CRADA's, and material transfer agreements, as well as invention reports. At some of our institutes, these activities are handled by one person; at others, they involve a larger staff and a dedicated office.

Just a note about the GAO report. NIH, to some extent, is a hybrid between a laboratory and an agency, and we have perhaps some semantics to discuss with GAO. We do have an ORTA not at the Department level but at the NIH level that interacts very directly with the technology coordinators at our component institutes as well as with individual scientists. The institutes, perhaps akin in some respects to departments within a laboratory rather than separate, geographically dispersed laboratories in their own right, also have very active and dedicated technology transfer staff as well.

We have some external efforts under way to expand access to technology transfer opportunities which include, for example, conferences such as our recent Joint Technology Transfer Program with the Pharmaceutical Manufacturers Association. Congresswoman Morella was very gracious to speak at the program at the end of April in Bethesda.

We also have put on line an electronic bulletin board that provides computer access via modem to current agency policies and to model agreements as well as CRADA opportunities and inventions that are available for licensing.

We are in the process of dividing the accumulated inventions of the Public Health Service into commercially relevant technology portfolios, such, for example, as cancer therapeutics, treatments for viral infections and other diseases, that will be marketed very aggressively to appropriate industry contacts, and I have today with me, Mr. Chairman, a portfolio of information about our program as well as the first of our targeted technology transfer invention portfolios dealing with licensing opportunities relating to AIDS, and I would like to give these to you, Mr. Chairman, and submit them for the record.

Mr. THORNTON. Without objection, the materials will be included in the record of the hearing.

Mr. ADLER. Thank you, sir.

[The materials mentioned above are available from committee files.]

Mr. ADLER. A few comments before I close on technology transfer issues.

NIH has taken a leadership role in developing a national consensus on some aspects of technology transfer, in particular, in an effort to break down some of the barriers to the sharing of biological research materials between investigators and academia, Government laboratories, and our counterparts in industry. NIH has hosted several national meetings where representatives of all three of these areas of research have worked toward developing a prototype uniform biological material transfer agreement. We are hopeful that such an agreement could be adopted by the heads of academic and Government research institutions to govern the more routine exchange of materials between their scientists without the customary practice of exchanging and negotiating a number of agreements and shipping papers. We hope to develop a similar agreement that might be utilized with industry for many cases of materials sharing between Government and academia to industry.

We would support very strongly Deborah Wince-Smith's remarks about software protection. We believe that copyright protections for software would be a very significant step toward enfranchising it as a transferable technology.

Lastly, we are evaluating the intellectual property aspects of our research developments in identifying genes and gene sequences, many of which will have commercial or therapeutically related products. While the planned rapid dissemination of sequence information through public domain DNA libraries is vital to ongoing research, we are concerned that the costs and some of the logistics in protecting commercial products based on genes might be enormous, and NIH, in conjunction with several other Federal agencies and industry, will be evaluating the possible importance of early patenting for DNA sequences and whether the problems that I have alluded to can be addressed in innovative ways.

To conclude, we are very proud of the real contribution that our technology transfer programs are making to improve the lives and health of patients, and this concludes my formal statements. I, too, would be pleased to answer questions from you, Mr. Chairman, and the subcommittee.

[The prepared statement of Mr. Adler follows:]

Testimony by

Reid G. Adler, J.D.
Director, Office of Technology Transfer

National Institutes of Health
Public Health Service
Department of Health and Human Services

On the Implementation of the Federal Technology Transfer Act of 1986

Before the

Subcommittee on Technology and Competitiveness
Committee on Science, Space, and Technology
United States House of Representatives

May 30, 1991

Mr. Chairman and Members of the Subcommittee:

The National Institutes of Health (NIH) appreciates this opportunity to highlight our progress in implementing the Federal Technology Transfer Act of 1986 (FTTA). I am pleased to provide an update on the state of the NIH technology transfer programs, and how these programs support our overall public health mission. My testimony will highlight several key aspects of our programs that we believe have been essential to their success.

The new NIH Director, Dr. Bernadine Healy, described the vital public interest context of scientific research at her Senate confirmation hearing in March, by identifying technology transfer as an essential ingredient to realizing the mission of NIH. She stressed that "discoveries of the laboratory must be carried to the bedside, and the development of new drugs, devices and diagnostic tests needs to be done in partnership with industry." This partnership, however, must develop under carefully crafted guidelines to ensure that the fundamental mission of NIH is preserved and that industry, academia and government work together honorably to ensure the public's trust.

Identification of the NIH mission

The FTTA requires each agency to determine the mission of its component laboratories. For NIH and its component institutes, this mission, enunciated in our 1989 policy statement on Cooperative Research and Development Agreements (CRADAs), is to conduct biomedical and behavioral research that will lead to better health for the American people. For our intramural (in-house) investigators, this agency mission prescribes the exploration of ideas, the communication of these ideas and information to the scientific and medical community, and a responsibility for the prompt and accurate publication of research findings.

We are concerned that interactions with industry do not cause a shift of our efforts away from their traditional laboratory and clinical orientation to problems of commercial development. Thus, our CRADA review process includes approvals by the laboratory or branch chief and by the scientific director responsible for the overall research agenda of the participating NIH component, as well as the CRADA Subcommittee of our Patent Policy Board. Consistent with our mission responsibilities, for example, NIH declines to protect the results of CRADA research as trade secrets for collaborators. This allows the results of CRADA research to join intramural research results in being communicated broadly to the scientific and medical community.

NIH CRADAs

Our CRADAs reflect a dynamic and synergistic collaborative research process. Many of the approved NIH CRADAs, numbering about 140 in total, provide resources and technological expertise that are vital to a project's success or product development -- but are resources that are unavailable in-house. Additionally, many of these CRADAs bring companies into a project so that a rapid "development" process can begin at the earliest possible stage and proceed in parallel with the underlying research.

CRADAs enable NIH investigators to enlarge their research efforts through a team approach that includes industrial or academic colleagues who may provide resources and expertise not available outside of a formal research agreement. Our corporate collaborators also are able to leverage their own research capital and personnel and, as noted above, often focus on the commercial development aspects of a CRADA project. To the scientist, this mode of technology transfer may be intellectually and emotionally satisfying, it may be accompanied by financial reward and it serves as one of the ways of fulfilling societal responsibilities.

For example, an exciting and extremely important group of CRADAs involves three NIH scientists -- Drs. W. French Anderson and Arthur Nienhuis of the National Heart, Lung and Blood Institute and Dr. Michael R. Blaese of the National Cancer Institute (NCI) -- and a biotechnology company, Genetic Therapy, Inc. (GTI) of Gaithersburg, Maryland. Their joint research efforts led to the design and production of a vector capable of genetically modifying an individual patient's own cells in order to introduce genes that produce enzymes for which the patient is deficient or that enhance the immune system's ability to fight tumors.

Clinical trials pursuant to this CRADA are underway at NIH to infuse back into patients cells grown and modified at GTI by commercial processes developed at that company, and they have shown encouraging results. Ongoing evaluation of clinical data at NIH offers hope for providing a functioning immune system for a nine-year old girl suffering from adenosine deaminase deficiency, a rare genetic disorder. Other clinical efforts are attempting to treat cancer by enhancing the anti-tumor activity of lymphocytes that were unable in these patients to successfully fight the tumor's growth. If this mode of therapy proves effective, potential applications of the technology may treat other genetic disorders such as hemophilia and sickle-cell anemia and diseases such as AIDS or heart disease. We believe that the CRADA program has advanced by several years the development of this technology.

The development of taxol has been identified as an emergency priority by NCI and the CRADA mechanism is of critical importance in meeting this challenge. Thus, the NCI CRADA between Dr. Dale Shoemaker and the Bristol-Myers Squibb Co. involves the joint clinical evaluation of taxol -- a highly promising treatment for ovarian, breast and possibly lung cancer -- in which our corporate research partner will focus much of its efforts on the development of synthetic or cell culture sources for producing this extremely rare compound in commercial quantities.

The only known source of taxol is from the bark of the Pacific Yew tree found in old growth forests in the Pacific northwest, which is also the habitat of the spotted owl. Given that the yew tree is in and of itself a significant environmental resource, this CRADA is part of the NCI effort to make taxol more readily available while at the same time recognizing the value and importance of these trees in our ecosystem. In an effort toward protecting our natural resources, NCI is exploring alternative sources to obtain large quantities of the compound.

Technology Transfer Incentives

An equally significant component of NIH's industrial technology transfer efforts involves the licensing of invention rights to discoveries made through intramural research. Examples of such inventions include the NCI AIDS diagnostic test kit, potential vaccines for several infectious diseases, and immunotoxin conjugates that specifically target therapeutic compounds for the treatment of several diseases including cancer. For both intramural and CRADA inventions, we believe that the royalty sharing provided under the FTTA does provide a real but limited incentive for technology transfer at NIH since it generally takes several years for basic research findings to be developed to the stage where marketing approval from the Food and Drug Administration (FDA) may be obtained. Also, only about one in five compounds submitted to FDA ultimately is approved for human use. Thus, significant royalty income may be somewhat illusory for many of our inventors and delayed for others, and identifying more effective incentives for our technology transfer program is a management challenge faced by many Federal laboratories.

NIH is developing other incentives, such as some type of prestigious annual Director's award and cash prize, for inventions of outstanding scientific or commercial value and for exemplary technology transfer activities. Also, NIH is evaluating the desirability of a program that might permit NIH scientists to provide limited technical assistance while on official duty to licensees of their inventions. Similar programs are under consideration at several other Federal laboratories and this continuity of involvement in the development of an invention might spark a heightened interest in the invention reporting and licensing process.

Technology Transfer Activities and Offices

The Public Health Service (PHS) agencies file well over 200 new patent applications per year and generate about $6 million in royalty income. NIH is taking a number of steps both internally and externally to evaluate and improve these patenting and licensing activities. Internal efforts are aimed primarily at improving the knowledge base and easing frustrations of our scientists with matters of technology transfer and at streamlining the overall invention reporting process. For example, in conjunction with the Training Subcommittee of our Patent Policy Board, the Office of Technology Transfer (OTT) presently is contracting for the development of an interactive instructional computer-based training and invention reporting program. This system will be updated regularly and will assist our investigators in understanding and completing the forms and other documents necessary for the technology transfer process.

External efforts by NIH to expand access to PHS technology transfer opportunities include, for example, conferences and an electronic bulletin board. This latter service provides on-line computer access via modem to current PHS policies and model agreements as well as to summaries of inventions that are available for licensing.

In order to improve our effectiveness in transferring technologies, NIH is expanding the staff in OTT's patenting and licensing branches. This fiscal year, OTT was given responsibility for managing the patent activities of the PHS, thus consolidating in one office the interrelated activities of patenting and licensing. The other PHS agencies that conduct scientific research are the Alcohol, Drug Abuse and Mental Health Administration (ADAMHA), the Centers for Disease Control (CDC) and the Food and Drug Administration. The development of OTT's activities occurs under the careful supervision of the joint NIH/ADAMHA/CDC Patent Policy Board and the scientific and technology managers of their laboratory components. NIH is thus considering carefully the appropriate level of technology transfer staff and services, both centrally and in our component institutes, which is necessary to provide liaison support to our laboratories and to identify and process for licensing inventions of potential commercial value.

The OTT is in the process of dividing the accumulated PHS inventions into commercially relevant technology portfolios, such as for cancer therapeutics and treatments for viral infections such as AIDS, that will be marketed aggressively to appropriate industry contacts. The specialists who will be in charge of these portfolios also will provide sophisticated advice at an early stage to individual scientists and their institute's technology coordinators about the commercial potential of specific research findings. We will continue to package related inventions together for licensing, a benefit made possible by OTT's centralized responsibility for managing the licensing of inventions made at NIH, ADAMHA and CDC.

Within NIH, each of the components has a designated Technology Development Coordinator (TDC) who has the responsibility for monitoring and processing CRADAs, material transfer agreements and invention reports. Such activities at some component institutes are handled by one person and at others involve larger staffs. The TDCs also participate interactively with OTT in the invention licensing process and several are developing their own evolving technology transfer initiatives.

Together with the technology coordinators of our organizational components, OTT continually is implementing and evaluating programs to make technology transfer more effective, and to promote collaboration opportunities to industry and to discuss policy development. NIH carefully has cultivated links with industry to ensure that the development of our technology transfer program itself is a collaborative process. For example, each fall, the NIH hosts an annual PHS Technology Transfer Forum, at which government scientists and industry representatives can meet face-to-face to explore collaboration opportunities. Solidifying linkages with industry are joint meetings such as the annual NIH-Pharmaceutical Manufacturers Association (PMA) technology transfer conference. At the second annual conference held April 25-26, 1991, in Bethesda, Maryland, over 160 industry, academic and government attendees discussed presentations on how new drugs are priced by pharmaceutical companies, assessing the patentability of biomedical inventions and valuing licensable technology. The technology transfer programs of several other federal agencies also were highlighted at the meeting.

Technology Transfer Issues

1. Materials and Data Sharing. NIH has taken a leadership role in developing a national consensus on several matters of technology transfer policy. For example, the NIH has spearheaded a national effort to break down some of the barriers to the sharing of research materials between government, academic and industry scientists. Increased attention to technology transfer and intellectual property rights, following enactment of the Federal legislative initiatives of the 1980s, sometimes has resulted in an extended approval path that often delays the traditional sharing of biological materials among scientists. NIH hosted two national meetings, in October 1990 and February 1991, where representatives of government, academia and industry developed a prototype "Uniform Biological Material Transfer Agreement." We are hopeful that such an agreement will be adopted by the heads of academic and government research institutions to govern the routine exchange of biological materials between their respective scientists. We hope to

develop a similar uniform agreement that might be utilized in many cases for the sharing of materials with industry.

2. Copyright for Software. Lack of ability to copyright government-produced computer software is perceived as a problem. This lack of protection also is perceived by many firms as an impediment for its commercial development. We believe that if copyright protection were allowed for such software, this would be a significant step towards enfranchising software as a transferable technology.

3. Patent Protection for Genes. A technology transfer issue with potentially significant implications for U.S. competitiveness has been raised. This relates to the costs and logistics involved in patenting commercial products derived from human genes. Over the next several years, we anticipate a rapid increase in the rate at which gene sequences will be determined, many of which will not have a known function or identifiable expression product. Thus, it may be difficult to speculate about and protect any ultimate therapeutic and commercial uses of such genes.

While the planned rapid dissemination of sequence information through public domain DNA libraries is vital to ongoing research, the initial U. S. patent application filing costs alone for these genes would be enormous, and foreign patent applications would be even more costly. Also, filing for protection of such sequence information might lead to active examination of these applications in the U. S. Patent and

Trademark Office before therapeutic indications could be developed for many of those sequences. Thus, absent meaningful patent protection for newly discovered genes at an early stage, these gene sequences might enter the public domain with no patent protection available for related commercial products. We believe that the patent incentive may be necessary to elicit the large sums of investment capital that likely will be required for such commercial products.

We will be evaluating the significance of these patent issues with NIH components including the National Center for Human Genome Research as well as with several interested biotechnology companies and the Office of Technology Commercialization of the Department of Commerce. Possibilities that will be considered include whether the early patenting of DNA sequences will be of importance in developing DNA-based therapeutics and other products and, if so, whether the problems identified above can be addressed in innovative ways, e.g., establishment of a consortium of companies to assist the government and academia in financing and managing such an immense invention portfolio, as well as the possibility of special examination procedures by the U. S. Patent and Trademark Office.

Closing Remarks

Dr. D. Allan Bromley, Director of the White House Office of Science and Technology Policy, was a keynote speaker at the NIH-PMA conference last month, where he congratulated the NIH as being regarded generally, within the government, as having the most aggressive, the most innovative, and the most effective technology transfer program. We are proud of the Administration's support for our efforts, and of the very real contribution that our program is making to improve the lives and health of patients.

This concludes my formal statement. I would be pleased to answer questions from the Members of the Subcommittee.

Biographical Information

Reid G. Adler is the Director of the Office of Technology Transfer at the National Institutes of Health. He manages the patenting and licensing of inventions for NIH and several other agencies of the Public Health Service. The Office of Technology Transfer also is responsible for developing policy recommendations for NIH and the Alcohol, Drug Abuse and Mental Health Administration on technology transfer matters.

A graduate of the National Law Center of the George Washington University, Mr. Adler is a former Law Clerk to the Honorable Giles S. Rich, U. S. Court of Appeals for the Federal Circuit. Mr. Adler was a Research Fellow at the Max Planck Institut for Foreign and International Patent, Copyright and Competition Law in Munich, Federal Republic of Germany, and he has published extensively on matters of biotechnology law and policy as well as on intellectual property issues. He teaches courses in biotechnology policy and the social impacts of biotechnology at the Johns Hopkins University and at the FAES graduate school at NIH, where he was formerly a research biochemist. Mr. Adler's publications include: "Biotechnology as an Intellectual Property," Science 224:357-363 (1984) and "Controlling the Applications of Biotechnology: A Critical Analysis of the Proposed Moratorium on Animal Patenting," Harvard Journal of Law & Technology 1:1-61 (1988). He recently edited a special biotechnology double issue of the American Intellectual Property Law Ass'n Quarterly Journal 16:287-563 (1989).

Mr. THORNTON. You will have that opportunity in just a few moments, and I appreciate your testimony.

Ms. Holston.

Ms. HOLSTON. Thank you, Mr. Chairman and members of the subcommittee.

I am pleased that the Food and Drug Administration is included among the agencies testifying on the implementation of the Federal Technology Transfer Act of 1986 and other technology transfer activities, and I am also very pleased to have with me, Dr. Ronald Hart from the National Center for Toxicological Research in Jefferson, Arkansas.

Currently, FDA is implementing the Act throughout the agency and its laboratories. Under FTTA, our centers and our Office of Regulatory Affairs have been designated as laboratories. However, in implementing the Act, we have had to deal with some very difficult issues, and one of the most difficult of those, of course, being how an agency such as FDA, a regulatory agency, can effectively implement the provisions of an Act that really encourages collaboration with regulated industry, and our policy concern has been over what is the appropriate role for FDA as a regulatory agency.

Many of you may know that FDA regulates $750 billion of the gross national product. Twenty-five cents of every dollar that a consumer spends is on a product regulated by the Food and Drug Administration. Our regulatory responsibility is to ensure the safety and effectiveness of products in such diverse and complex areas as foods, cosmetics, human and animal drugs, medical devices, radiological products, vaccines, and blood products, and, given such a broad public health responsibility, we are very concerned with maintaining the public's confidence in both our regulatory activities and the integrity of our decisions regarding them.

Therefore, we have struggled with how best to reconcile our principal role as a regulator and our new role as a collaborator with regulated industry in implementing FTTA. We believe that we have made progress, especially in the past year, in finding effective ways to promote the transfer of technology from FDA to the public sector.

At this time, we have approved a total of 13 Cooperative Research and Development Agreements. We have also engaged in a number of other technology transfer activities, and we really hope to build on this experience to help the agency and our scientists meet the goals of technology transfer under the Act.

Before discussing any specific accomplishments, I would like to explain briefly what we try to do and what our experience has been.

Soon after the passage of the Act, we created a working group called the Federal Technology Transfer Act Task Force to propose policies and strategies for implementing FTTA. The task force has representatives from each of our agency's major components as well as the Office of our General Counsel, the Division of Ethics and Program Integrity, and other staff offices and the Office of the Commissioner.

Initially, there were many concerns raised by the Task Force Members and other senior managers throughout the agency regarding FTTA, and the major concerns were: first, whether——

Mr. THORNTON. Might I ask that you suspend for just a moment while I determine whether or not we might use the same procedure just passed to be able to continue the hearing. I would like to ask Ms. Horn to take the chair, and several of us will go make the vote and then return and continue the hearing.

Ms. HOLSTON. Yes, Mr. Chairman.

Ms. HORN [presiding]. Please proceed.

Ms. HOLSTON. Thank you.

As I was saying, initially there were many concerns that were raised by our Task Force members and other senior managers throughout the agency, and the first of these concerns was whether it was appropriate, in fact, to participate in the Act's mandate and, second, how FDA as a regulatory agency could implement such provisions and still effectively accomplish our mission, which is regulatory enforcement. These issues were discussed by the FDA Policy Board, which includes our Commissioner and our Deputy Commissioner and the senior policy officials of the agency. Many questions were raised, particularly in the area of conflict of interest.

FDA has set very high standards for avoiding the appearance of both individual and organizational conflict of interest. For your information, FDA's standards of conflict incorporate and substantially strengthen those that are in effect for the entire Department of Health and Human Services, and they do address our responsibilities as a regulatory agency and as individuals who work in a regulatory agency for maintaining high standards of ethical conduct in our dealings with the regulated industry.

The Policy Board discussed what could occur when the agency started entering into collaborative arrangements under FTTA and the possible appearance problems that such agreements could cause, and we were also aware of the possibility that those collaborations could result in products that, at one point, could come back to the agency for regulatory action, and therefore we recognize the need to be sensitive to the potential for putting the agency and its scientists in a compromising position as a result of such collaborative relationships with regulated industry.

To avoid this potential problem, we took action to institute an agency policy that could avoid the appearance of conflict so that collaborations could take effect. We established what we call a two-tier formal review process for cooperative research and development agreements, and this review process takes place after the FDA laboratory has negotiated a CRADA with a collaborator.

That CRADA is reviewed throughout the agency by various Centers, by our Office of General Counsel, by our Division of Ethics and Program Integrity, for any possible individual or potential conflicts of interests, and after the laboratory entering into the CRADA has resolved any issues that have been raised by the reviewers, that CRADA is then sent to our FDA CRADA Review Board, which is made up of five members at the policy level in the agency, including our Associate Commissioner for Regulatory Affairs, who is the chairperson, myself, our Chief of Staff, our Chief Counsel, the Director of our Office of Biotechnology, and that Board reviews and makes a recommendation to the Commissioner as to what action should be taken with that CRADA, and I am happy to say that in the last two weeks Dr. David Kessler, our Commissioner, has acted favorably on three additional CRADAs using this two-stage review process, and this process, although it is still evolving, has been very helpful to the agency.

Our experience is that it is very difficult for regulatory agencies to participate fully in meeting the provisions of the Act. We believe, however, that our CRADA Review Board has assured that our collaborations are directly related to the agency's mission and that these efforts have also contributed significantly to our successful participation in FTTA.

To promote the interests of our scientists in technology transfer activities, we have held individual training and orientation sessions throughout the agency, including in our field offices and for the staff of the Office of the General Counsel. In the future, we plan to hold sessions annually for new employees and for additional field laboratories.

We have also participated, along with the other Public Health Service agencies, in various technology transfer forums and technology transfer conferences; we have listed our patents which are available for commercialization; we have scientists who have displayed scientific abstracts at these various conferences; and we have always had FDA representatives present to answer questions and to provide information. We also stay in frequent contact with other Federal agencies, both regulatory and nonregulatory, and we continue to share information and to learn from each other.

FDA representatives regularly attend the PHS Patent Policy Board meetings and the Technology Development Coordinator Meetings to exchange ideas and information regarding technology transfer.

These activities represent just some of our efforts to implement FTTA in the agency. As I noted earlier, we have approved 13 CRADA's, and even though we have disapproved only one, we have pursued that project even by using a different mechanism. In addition, we have 95 actions at various stages of the patent and licensing process, and some of these, we believe, will result in patents and commercialization in the future.

If I can just give you one example, the National Center for Food Safety and Technology in Illinois is an example of a creative approach that the agency has taken to encourage scientific collaboration. We have not only used the CRADA under FTTA, but we have used other mechanisms, including a contract and a cooperative agreement, and we have worked with industry and academia to establish this Center at the Illinois Institute of Technology in Chicago. The CRADA will involve industry and academic institutions in collaborative research projects on food safety and food technology, and we believe that the establishment of this Center represents a substantial investment for the agency and will be of significant value in the future. The CRADA authority was very helpful in helping to establish this.

In the future, we want to continue to be responsive to ideas for creating appropriate collaborative relationships under FTTA and to do so to the fullest extent possible. We have accepted what we believe is the special challenge of implementing FTTA in a regulatory environment, and we believe that the CRADA authority, appropriately used, is very beneficial to our scientists, to the agency, and to the public.

Madam Chairman, this concludes my remarks, and Dr. Hart and I will be happy to answer any questions.

[The prepared statement of Ms. Holston follows:]

DEPARTMENT OF HEALTH & HUMAN SERVICES

Food and Drug Administration
Rockville MD 20857

STATEMENT
by
SHARON SMITH HOLSTON
ASSOCIATE COMMISSIONER FOR MANAGEMENT AND OPERATIONS
FOOD AND DRUG ADMINISTRATION
PUBLIC HEALTH SERVICE
DEPARTMENT OF HEALTH AND HUMAN SERVICES

BEFORE THE

SUBCOMMITTEE ON TECHNOLOGY AND COMPETITIVENESS
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
UNITED STATES HOUSE OF REPRESENTATIVES

May 30, 1991

FOR RELEASE ONLY UPON DELIVERY

Mr. Chairman and Members of the Subcommittee:

I am pleased that the Food and Drug Administration (FDA) is included among the agencies testifying on the implementation of the Federal Technology Transfer Act (FTTA) of 1986 and other technology transfer activities. Accompanying me today is Dr. Ronald W. Hart, Director of FDA's National Center for Toxicological Research.

Currently, FDA is implementing the Act throughout the Agency and its laboratories. Under FTTA, our Centers and Office of Regulatory Affairs have been designated as laboratories. However, in implementing the Act, we have had to deal with some very difficult issues. One of the most difficult issues is how can a regulatory enforcement Agency such as FDA effectively implement the provisions of an Act that encourages collaborations with regulated industry. Our policy concern has been over what role is appropriate for FDA as a regulatory Agency.

FDA regulates $750 billion worth of this country's Gross National Product (GNP) and 25 cents of every consumer dollar spent is for products regulated by FDA. FDA's regulatory responsibility includes such diverse and complex areas as foods, cosmetics, human and animal drugs, medical devices, radiological products, and vaccines and blood products. Given such broad public health responsibilities, we are very concerned with maintaining the public's confidence in both our regulatory activities and the integrity of our decisions regarding them. Therefore, we have struggled with how best to reconcile our principal role as regulator and our new role as a collaborator with regulated industry in implementing the FTTA.

We believe that we have made progress, especially in the past year, in finding ways to promote effectively the transfer of technology from FDA to the public sector. At this time, there are a total of thirteen Cooperative Research and Development Agreements (CRADAs) that FDA has approved. We have also engaged in a number of technology transfer activities. We hope to build on this experience to help the Agency and our scientists meet the goals of technology transfer under the Act.

Before discussing specific accomplishments, I would like to explain briefly what we have tried to do and what our experience has been. Soon after passage of the Act, FDA created a working group to propose policies and strategies for implementing FTTA. The Office of Management and Operations took the lead in this initiative. We created a working group, the FTTA Task Force, with representatives from each of the six Centers (Center for Biologics Evaluation and Research, Center for Food Safety and Applied Nutrition, Center for Drug Evaluation and Research, National Center for Toxicological Research, Center for Veterinary

Medicine, and Center for Devices and Radiological Health); Office of Regulatory Affairs; Office of the General Counsel; Division of Ethics and Program Integrity; and other staff offices in the Office of the Commissioner. Initially, there were many concerns raised by the Task Force members and other senior managers throughout the Agency regarding FTTA. The major concerns were: first, whether it was appropriate to participate in the Act's mandate; and, second, how we, as a regulatory Agency, could implement such provisions and effectively accomplish our mission of regulatory enforcement.

In April 1988, these issues were discussed by the FDA Policy Board which includes the Commissioner, Deputy Commissioner, Associate Commissioners, Center and Office Directors and other Senior Staff. Many questions were raised, particularly in the area of conflict-of-interest. The Agency has set high standards for avoiding the appearance of both individual and organizational conflict of interest. For your information, the FDA conflict-of-interest standards incorporate and substantially strengthen those of the Department of Health and Human Services. They address our responsibilities as a regulatory Agency and as individuals in a regulatory Agency for maintaining high standards of ethical conduct in our dealings with regulated industry.

The Policy Board discussed what could occur when the Agency started entering into collaborations under FTTA and the possible "appearance" problem such agreements could cause. We also were aware that such collaborations most likely would result at some point in a product coming back to the Agency for regulatory action. Therefore, we recognized the need to be sensitive to the potential for putting the Agency and its scientists in a compromising position as a result of such collaborative relationships with regulated industry.

To avoid this potential problem, we took action to institute an Agency policy that would avoid the appearance of any conflict in order for a collaboration to be undertaken. The Policy Board concluded that FDA should not act precipitously, but should deliberately and carefully consider how best to assure that the necessary steps are taken to protect our credibility with the public.

We do not want to risk public confidence in the credibility of our regulatory decisions. We are particularly concerned that the public not receive negative perceptions that FDA has CRADAs with regulated industry and that our scientists may receive monetary benefit from royalties as a result of such CRADAs.

The Policy Board and the FTTA Task Force have been very sensitive to these concerns. To address them the Agency established a two-tier formal review process, described below, and created a CRADA Review Board made up of high ranking individuals within the

Agency. The purpose of this review process is to assure that the appearance of conflict-of-interest is resolved and improprieties are avoided both individually and organizationally.

The review process involves two separate stages following negotiation of the CRADA by the FDA laboratory and the collaborator, with advice and assistance from appropriate parts of FDA and the Office of General Counsel. This usually involves advice regarding the business arrangements and any special provisions necessary for the collaboration (e.g., patent protection, future rights, and royalties.) CRADAs are reviewed by all Centers and the Office of Regulatory Affairs for any potential organizational conflicts of interest, and by the Division of Ethics and Program Integrity for any potential individual conflicts of interest. After the laboratory has addressed any issues that have been raised by the reviewers, the Center Director forwards the CRADA to the FDA CRADA Review Board.

The Review Board consists of five members who hold policy-level positions within the Agency: the Associate Commissioner for Regulatory Affairs, Chairperson; the Associate Commissioner for Management and Operations; FDA Chief of Staff; Director of the Office of Biotechnology; and the Chief Counsel, Food and Drug Division, Office of the General Counsel.

The Board reviews all FDA CRADAs and recommends to the

Commissioner what action should be taken: accept the CRADA, make modifications to it, or reject it. This recommendation is based on the Board Members' careful review of the CRADA, its purpose, terms, relevance to FDA's mission, any problems that it may pose for the Agency, conflict-of-interest resolution, whether the project falls within the intent of the Act, whether a collaboration is the appropriate way to conduct the research project, and any other issues the Board members identify. The Board also considers the potential public health benefit of the anticipated results of the collaboration. In the last few weeks Dr. Kessler has acted favorably on three CRADAs using the two-stage review process.

The review process, although still evolving, has been very helpful to the Agency. From our experience, we know that it is very difficult for a regulatory agency to participate fully in meeting the provisions of the Act. We also believe that the CRADA Review Board has assured that our collaborations are directly related to the Agency's mission, and that the efforts of the members of the CRADA Review Board have contributed significantly to our successful participation in CRADAs and the Federal Technology Transfer Act.

At the operational level, the members of the FTTA Task Force serve as FTTA liaisons for each of their organizations. They are the contact points for questions, inquiries, and information from inside and outside FDA regarding various aspects of technology transfer. They are identified by name, organization and telephone number in information packages we have made available in meetings and conferences to promote interest in technology transfer activities.

To promote the interest of our scientists in technology transfer activities, we have held individual training/orientation sessions for each of our Centers (which, as I mentioned earlier, we have identified as laboratories under the Act), several field laboratories, and the staff of the Office of the General Counsel, Food and Drug Division. These sessions have included an overview of the Act, implementation in FDA, CRADAs, conflict of interest policies, the patent process, and the licensing of Intellectual Properties. In these sessions, we have included patent attorneys from the DHHS Patents Office (currently part of NIH's Office of Technology Transfer), and from the Commerce Department's National Technical Information Service for licensing matters. During these orientation sessions, we have given a comprehensive FTTA reference booklet to each attendee. In the future, we plan to hold sessions annually for new employees and for additional field laboratories.

As part of our efforts to promote interest and engage in technology transfer, FDA has participated in past PHS Technology Transfer Forums and the March 1990 Pharmaceutical Manufacturers

Association/NIH Technology Transfer Conference, and other technology transfer conferences. In the past, listing of patents which are available for commercialization have been provided to Forum attendees. FDA scientists have displayed abstracts during the Forums and FDA representatives have been present to answer questions and provide information.

We also stay in frequent contact with other Federal agencies, both regulatory and non-regulatory, and continue to share information and learn from each other. FDA representatives regularly attend the NIH Patent Policy Board meetings and the NIH/ADAMHA/CDC Technology Development Coordinators meetings to exchange ideas and information regarding technology transfer. We also attend the Federal Laboratory Consortium meetings and a number of our FTTA liaisons have attended OPM's two-week training program on technology transfer to further our internal capability for managing technology transfer.

These activities represent some of our efforts to implement FTTA in the Agency. As noted earlier, FDA has approved thirteen CRADAs. Even though FDA disapproved one project as a CRADA, we are pursuing the project by using a different mechanism. In addition, we have ninety-five actions at various stages of the patent and licensing process. Some of these, we believe, will result in patent and commercialization in the future.

The National Center for Food Safety and Technology is an example of a creative approach the Agency has taken to encourage scientific collaboration. Through the use of several mechanisms, including a contract, a Cooperative Agreement and a CRADA, the Agency is establishing the Center in Chicago, Illinois. The CRADA will involve industry and academic institutions in collaborative research projects. The establishment of this Center represents a substantial investment for the Agency and we believe it will be of significant value in the future. The CRADA authority was very useful in accomplishing this.

In the future, we want to continue to be responsive to ideas for creating appropriate collaborative relationships under FTTA and to do so to the fullest extent possible. We have accepted the special challenge of implementing FTTA in FDA, and we believe that the CRADA authority, appropriately used, is very beneficial to our scientists, to the Agency, and to the public.

Mr. Chairman, this concludes my statement. Dr. Hart and I will be happy to answer any questions you may have.

Ms. HORN. Thank you to all of you.

The gentleman from Arkansas is here, and I know he needs to vote, so we will let him have the first opportunity as to questions.

Mr. ANTHONY. Thank you very much, Madam Chairman, for yielding time to me, and I thank the Chair for allowing a nonmember to come in.

I have had a long working relationship with NCTR, and I have a very positive working relationship with Ron Hart as well as other distinguished members of NCTR, and I am very, very proud of that facility, and, Ms. Holston, I would like to note that in the subcommittee report there are some very, very glowing, positive comments from the people who personally went down and looked at NCTR. I notice, though, that in the final report, some of that seemed to be edited out, which concerns me a little bit.

But just one broad question. I assume you have had an opportunity to look at the subcommittee findings.

Ms. HOLSTON. Yes.

Mr. ANTHONY. Do you concur with the positive statements in terms of what the facility has, and the personnel that is there, and that it can't be matched dollar for dollar, and that it would be foolish to close it down?

Ms. HOLSTON. I certainly agree that NCTR is a jewel in the crown of the Food and Drug Administration and is an institution that we are very proud of. I personally made several trips to NCTR, and I work very directly with the officials at the center, including Dr. Hart, and I agree with everything the subcommittee has said.

Mr. ANTHONY. They do beautiful work, and I, as a result, have gone to bat for them through the appropriations process and gotten several millions of dollars for them and to rehabilitate some of the old structures out there, which they did on a cost basis that probably is the lowest in the entire research facilities owned by the Federal Government.

In the subcommittee report, it specifically mentions two direct projects that they are working on that relate to the regulatory function of the FDA. It mentions three additional that are in the priority lists, and it mentions seven of the top 20 that they could be a contributor of. That is 12 of the 20. And I guess what I would do is just encourage you to work with NCTR to see if you could pull them into all 20 so that the country as a whole would not lose this wonderful facility and the research that comes out of it and whether or not there could be any private sector-FTTA collaboration that would go to the marketplace. That would just have to be seen. But it appears to me that, working very closely with the facility and with FDA, that this regulatory policy can be achieved so that everybody benefits here.

There is one thing, though, that was mentioned there that does bother me a little bit, and that is the separation of distance. You flew to Little Rock, and you drove to Jefferson. You probably thought you would never get to NCTR. That is pretty much the basic feeling.

The first time I went to NCTR, there were three scientists from Tokyo, and Ron Hart introduced me to them, and I said, "Now, isn't that a shame?" I said, "Three scientists from Tokyo know where NCTR is. I bet I could go ask a hundred people in Pine Bluff and they never heard of NCTR." I mean that is the kind of facility that the Federal Government is operating and running, where people all the way from Tokyo know about it, want to come and see and understand more about it, and I think that is just a little story that needs to be in the record that you need to be keenly aware of.

But inasmuch as there may be some skepticism because of the distance, I would strongly encourage you to take a look at satellite and the possibility of satellite transmission, hooking up a multitude of these facilities so that there could literally be day-to-day conversations back and forth, so that this potential alienation could be quickly overcome by using another high technology form of communication.

And, Mr. Chairman, I just want to again thank you for yielding, and I look forward to working with FDA; I look forward to working with Ron Hart at NCTR and also with you, Ms. Holston, in trying to overcome any policy problems that you have so that we can both accomplish our goal, and that is to keep NCTR moving forward within your regulatory function and framework and be a positive contribution to the health and safety of the country.

Thank you.

Mr. THORNTON [presiding]. The gentleman from Arkansas' remarks are appreciated.

I would like at this time to enter into the record part III of the report, the summary of the National Center for Toxicological Research, findings of the subcommittee. The first sentence is: "It is the judgment of Members of the subcommittee who visited NCTR that the facility represents a unique and enormously valuable resource," and the final sentences of the findings are: "Given the importance of science to agency decisions and the high quality of NCTR staffing facilities, it would be imprudent for FDA to release this outstanding resource without the most careful consideration. Ideally, FDA should recognize this resource and utilize it more forcefully and more completely to meet agency needs." And then the final sentence: "High quality science and scientists are in too short a supply for the agency casually to distance itself from this unusually productive and distinctive institution," and I would like to join my colleague from Arkansas in inviting the Commissioner, Mr. Kessler, to come down to the facility some time for a visit.

[The document follows:]

PART III. THE NATIONAL CENTER FOR TOXICOLOGICAL RESEARCH

FINDINGS—

It is the judgment of members of the subcommittee who visited NCTR that the facility represents a unique and enormously valuable resource, both to FDA and to other government and private agencies. The subcommittee found, however, rather widespread feelings that NCTR has not adequately supported FDA priorities and that other agency components have not adequately utilized NCTR capacities. It is not surprising, therefore, that there is a good deal of skepticism on both sides that greater relevance is achievable.

NATURE OF THE FACILITY—

The subcommittee heard presentations from NCTR leaders, and two subcommittee members visited the Center in Jefferson, Arkansas. NCTR is the largest non-military federal installation in the state and the largest in the lower Mississippi basin (Arkansas, Louisiana, and Mississippi). One hundred twenty-eight full-time scientists, supported by 169 technical staff, work in 214,000 square feet of laboratory space. Two hundred thirty-eight additional staff members work at NCTR. Of the total 535 people who work there, approximately 240 are NCTR employees, while the balance are contractor employees engaged pursuant to OMB Circular A-76.

The professional qualifications of NCTR scientists are impressive. Of the 128 full-time scientists, 80 have Ph.D.'s, M.D.'s, or equivalents. Publications by NCTR staff in peer-reviewed scientific journals totalled 211 in 1988, 220 in 1989, and 227 in 1990, continuing an unusual record of scientific productivity. Of NCTR's total budget of $30 million, 5.4 percent ($1.6 million) was contributed by agencies outside FDA, principally by the Department of the Army, NIH, and NIDA. Obtaining this funding on a competitive basis is another sign of the quality of NCTR's staff and work.

For those familiar with FDA's inadequate headquarters or field laboratories, the NCTR facilities present a dramatic contrast. Constructed for the Department of the Army to extremely demanding scientific specifications, the facilities today would cost hundreds of millions of dollars to replicate. In FDA terms, NCTR laboratories are well-maintained and superbly equipped with instrumentation and animal facilities. There are probably few if any university or other research institutions that could match the breadth and quality of NCTR's facilities and equipment.

NCTR has developed ties with institutions in the region. The president of NCTR-Associated Universities, who spoke before the subcommittee, expressed strong support for NCTR activities.

RELEVANCE OF THE FACILITY'S WORK TO THE FDA MISSION—

Although mindful of the skepticism, both inside and outside FDA, as to the relevance of NCTR's work to agency decision-making, the subcommittee finally concluded that it was not in a position to make a comprehensive judgment. It may be, however, that there is more potential for relevance than the skeptics acknowledge. It appears, for example, that the dietary studies are of great value potentially to the Center for Drug Evaluation and Research, the toxicological and microbiological studies to both the Center for Food Safety and Applied Nutrition and the Center for Veterinary Medicine, and the primate work to several other FDA units. These are in addition to the specific work performed for various Centers elsewhere in FDA, principally CFSAN.

The subcommittee also notes that a majority of the top 20 agency priorities presented to the full Advisory Committee by an FDA Associate Commissioner on December 17 appear to relate directly to work that NCTR either is pursuing or could pursue. Two specifically relate to work performed by NCTR:

- refining the assumptions used in risk assessment by developing models for non-carcinogenic as well as carcinogenic risks; and
- conducting research in biomarkers, molecular modeling, cell proliferation, genetic toxicology, and risk calculation, to support FDA's regulatory and consumer protection functions.

At least three additional priorities seem designed to play to NCTR's strengths:

- assessing and testing the performance of devices employing new technologies in areas such as microelectronics, biomaterials, toxicology, electromagnetic compatibility, and medical imaging;
- implementing the Pesticide Monitoring Data Initiative Act, including the development of more accurate residue detection methods; and
- ensuring the safety and efficacy of biological products, including blood products and test kits, bacterial products, cellular therapies, and growth factors.

And beyond those five there are an additional seven of the top 20 priorities to which NCTR could contribute:

- Strengthening field laboratory capability to support regulatory analysis;
- Maintaining an effective scientific capacity in emerging technologies in order to speed processing of petitions for food additives employing biotechnology;
- Reviewing biological products;
- Developing chemical and microbiological standards and HACCP programs in the area of seafood;
- Ensuring a technically competent field staff of chemists, microbiologists, and entomologists, with adequate scientific and information support, in laboratories testing imports;
- Postmarket surveillance and epidemiology of drugs; and

- Premarket review of new human drugs.

The subcommittee believes that the issue of NCTR's organizational placement should be brought before the full Advisory Committee. The subcommittee is of the view, however, that there is an inadequate record on which to make a considered recommendation for a specific alternate location. Moreover, given the importance of science to agency decisions and the high quality of NCTR staff and facilities, it would be imprudent for FDA to release this outstanding resource without the most careful consideration.

Ideally, FDA should recognize this resource and utilize it more forcefully and more completely to meet agency needs. Achieving this will require attention from top managers at NCTR and throughout the agency. It will not happen automatically; it will take time during a period when FDA management will be stretched on a variety of other pressing tasks. But high quality science and scientists are in too short a supply for the agency casually to distance itself from this unusually productive and distinctive institution.

RECOMMENDATIONS—

Without attempting a catalog of all the possible ways in which NCTR's relevance can be tested and improved, the subcommittee recommends the following:

- Integration of NCTR capacities into the top 20 and other key agency objectives.
- Reinstitution of a senior policy board or another similar mechanism charged with integrating the work of NCTR with FDA priorities and needs.
- An annual or semi-annual meeting of FDA scientists at the NCTR (not in Washington) so that the value of this extraordinary facility can be appreciated and synergies between Centers encouraged. Finding ways to overcome the natural skepticism about distant institutions is a high priority in this effort. This can most effectively be done if working scientists, not just center directors and commissioner's staff, are introduced to each other regularly.
- Creating an Associate Commissioner for Science with responsibility for overall agency scientific needs, or assigning to a specific senior agency executive responsibility for facilitating joinder and resolution of scientific issues that cut across Center boundaries and representing the agency to other government agencies on such cross-cutting issues.

Mr. **Anthony**. Would the chair yield?

Mr. **Thornton**. I would yield.

Mr. **Anthony**. I would personally be willing to participate in that, and I think it would be a wonderful thing to do. It is a facility that you almost have to see first-hand to truly understand the impact and the significance of what is going on there. So I would be pleased to act as a cohost.

Mr. **Thornton**. Thank you very much, Mr. Anthony.

We will continue with the opportunity to ask questions of the witnesses, and I would like to, at the outset, thank each of you for participating in this hearing and for your good testimony.

I think that one of the things that concerns me in an overall way—and I don't know that there is an answer to it—is that section 12 of Stevenson-Wydler states that laboratories should give a preference for a CRADA to businesses located within the United States that agree to substantially manufacture any resulting invention in the United States.

What precautions, if any, are labs taking to prevent a firm with whom it has negotiated intellectual property rights for an invention from selling those rights later to a foreign company or for production overseas? Is there an answer to that question?

Let me start with you, Ms. Wince-Smith.

Ms. **Wince-Smith**. Thank you, Mr. Chairman.

That part of the Act, of course, is a very integral part of our implementation plan, and I know that there have been a few cases where the Dole-Rockefeller amendment to the 1986 Act, which specifically gives the laboratory director the authority to not enter into any relationship with a foreign entity if comparable opportunities are not provided to U.S. entities, that has been exercised a few times.

I think what we really need to look at in this case is the broader issue, which I covered in my written testimony. And this is that we have a real systemic problem in the United States that, in spite of the progress since the 1980's and the 1986 Act, U.S. industry is not really going into our laboratories in the sense that our foreign competitors are. If you look at the statistics of the number of foreign visitors who come and see our labs as strategic assets it is very alarming. They are there and our people aren't, and this is a cultural problem, it is an outreach problem, and it is something that all of us have to give all of our attention to.

I mentioned JPL earlier, and when I was out there in January they are doing very exciting advanced work. I have heard some experts say in the microelectronics area it is better than anything in the country. And who is all over the outside of that facility, trying to partner with them? Nippon Steel. Our foreign competitors realize that these assets are there. We have got to get U.S. industry involved.

In terms of putting very specific barriers to foreign competitors, I don't think we have those in place. I don't think we should put them in place. We need to look at the positive steps we can take to attract U.S. industry. But I will mention here that, in particular, the Japanese—some people in this room remember, when the 1986 Act was being developed, when it was in the process of being put forward, the Japanese protested it. They felt, you know, that it was discriminatory because they were not given the same advantage for CRADA's that U.S. firms were. Well, I happen to think as a taxpayer, that we should give preferential treatment to U.S. firms who are going to be manufacturing and doing this work in the United States. And that is our policy.

Mr. THORNTON. I would like to refer to your written testimony for emphasis. At pages seven and eight, you make the strong point that one of the most important steps that Federal Departments and Agencies can take is adopting technology transfer to, and commercialization by, the private sector must be a goal in each Federal laboratory's mission, and then the concluding sentence of that paragraph: "Technology transfer and commercialization functions must be integrated into the laboratory's administrative structure, and the laboratory directors must be personally involved in encouraging and monitoring progress in this area." I think that is as good a statement of the Congressional intent in moving this Act forward as I have heard, and I wanted to come back to it and ask you to expand on it, if you want to, but it is a fine summary of the intent.

Ms. WINCE-SMITH. Thank you, Mr. Chairman. I would like to take the opportunity to expand on it just a minute.

One of the things I feel I have learned in my position at the Commerce Department as a political appointee is that leadership has to come from the top, and it is individuals who make things happen, not organizations. And it is often easier—in fact, it is always easier—to say "no" than to say "yes" to something. And when you are trying to change a culture and you are trying to do things differently than we have done, you have to have the top of the organization behind it, and clearly, when you look at the agencies and the labs that have seen a lot of progress you see that personal leadership at play. We are seeing it in the Department of Energy with Secretary Watkins. We are seeing it at the National Institutes of Health, we are seeing it in the Department of Agriculture, many of the Departments. We are seeing it at a place like Hanscom Air Force Base today where, right now, they are having their second industry outreach program with Massachusetts' governor as a partner. And this was the initiative and leadership that came from General Fornell, one person who decided up at Hanscom, the commanding officer, "I am going to make technology commercialization an integral part of my mission. I am going to open up the facility where AWACS were developed and all the electronic advance work with Lincoln Labs to our private sector," and he is making it happen through that leadership.

I would like to submit for the record, if I could, the memorandum that Secretary Mosbacher issued last October as a model of this leadership, because he has directed all of our units to change their organizational function and really make technology transfer part of that.

Mr. THORNTON. That document will be received into the record, without objection, at this point.

Ms. WINCE-SMITH. Thank you.

[The document follows:]

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

OCT 15

MEMORANDUM FOR Heads of Operating Units

SUBJECT: Making Technology Transfer a Part of the Commerce R&D Mission

The Department of Commerce has long exercised a leadership role in seeking to promote private sector commercialization of the research and development work carried out by the Federal laboratories. We continue to work to assist other Federal agencies and departments engaged in research and development activities to carry out the provisions of the Federal Technology Transfer Act (FTTA), the National Competitiveness Technology Transfer Act and related legislation.

One of the most fundamental steps toward a successful technology transfer program in the Federal laboratories is the adoption of technology transfer as an organizational mission of the laboratories. Technology transfer must be more than an afterthought in our research and development work. It must be one of our basic institutional goals. For that reason, I am directing each of you to take the necessary steps, through revision of your Organization & Function Orders and whatever other initiatives are necessary, to ensure that the successful implementation of the FTTA becomes one of the basic missions of the research and development activities carried out within each of your organizations.

The Technology Administration-chaired DoC Technology Transfer Board is the proper vehicle to address these concerns and then report back to me on your initiatives.

Secretary of Commerce

Mr. THORNTON. I also want to take just a moment to ask you to wear your hat as Chairman of the Interagency Committee and to express my view that, in that capacity, you have a very special opportunity to work toward the development of comprehensive goals and strategies reaching across a broad spectrum of activities to move America forward in what I have been referring to as a Marshall Plan for America, and I hope that you will find it of interest to assist in the development of that concept.

Ms. WINCE-SMITH. Well, Mr. Chairman, as you know, I had the great honor to sit at the luncheon where you addressed our conference for U.S. industry on access to Japanese science and technology. There you outlined the concepts of it in the most inspirational way, and I very much endorse what is behind that leadership.

Our Interagency Committee plays a very important role not just in developing policy and looking at areas that are problems, but information sharing at the right level. We encourage and want the other assistant secretaries to come and hear the success stories, hear the models that are going on in other Departments.

I was particularly pleased with Ms. Holston's testimony. Because I think she outlined very eloquently and with great insight what the challenges are for a regulatory agency to enter into CRADA's. It is a very different challenge than a laboratory such as NIST, which we have in Commerce. And to share those types of experiences and to try to come up with common understandings but recognize still that each of these facilities has some unique characteristics is very important. And, as we look at issues such as how to handle ownership of technical data, and the whole issue of recoupment as barriers, disincentives to engaging our private sector, we are going to have to be sensitive to the fact that the various Departments and agencies have different missions, different functions, different experiences. But our committee can play a unique role in trying to balance these differences in the national interest and carry it up to the White House through the President's Council on Competitiveness. And that is what we are trying to accomplish.

Mr. THORNTON. I appreciate that, and I would like to ask Ms. Holston to comment further with regard to that question, because indeed there is a concern when an agency must regulate and also encourage. However, it seems to me—and I would ask whether you agree—that one can encourage good science and the application of good science and work at the same time to lower restraints or bureaucratic difficulties that people may have in proceeding through a maze.

The overall goal should be to have the best possible products coming to the market, should it not?

Ms. HOLSTON. Mr. Chairman, I wholeheartedly agree, and FDA has been extraordinarily encouraging of trying to make FTTA work in a regulatory environment, and we have worked very hard since the passage of the Act to make it possible for our scientists to actually participate. In fact, much of the reluctance has been on the part of the scientists themselves who have been concerned about the appearance issues that can arise from collaborating with regulated industry.

Obviously, if we are not talking about a regulated firm, then we don't have an issue as far as FTTA is concerned, and we, you know, strongly encourage our scientists to enter into those kinds of agreements.

But in the instance where it is possible to collaborate with a firm whose products we regulate, then we must be extremely careful to avoid any loss of confidence on the part of the public in the objectivity of our decisions. We certainly wouldn't want the public to believe that a decision we made on the safety or effectiveness of a product we regulate was in any way influenced by the fact that we have an agreement with a firm or there is a possibility of a royalty coming from a product that issues out of a collaboration, and so we have developed, as I mentioned in my testimony, this two-tier review system to ensure that the appearance issues are minimized, and in one case in particular, for instance, in our Center for Biologics Evaluation and Research, where a scientist is collaborating with a firm that is a regulated firm on the development of a process for vaccine delivery, we have put into place a mechanism whereby that particular scientist will be isolated from the review process.

Now, in an agency like ours which is not, you know, overly endowed with resources, that can be a problem inasmuch as that particular scientist is also an expert in the review process.

Mr. THORNTON. I am shocked that there is an agency that is not overendowed with resources.

Ms. HOLSTON. But what we have tried to do is to make it possible—because we believe in the product, we believe in the collaboration, we have tried to make it possible, even for that scientist, to be removed from his regulatory responsibilities in order to further the interests of the collaboration, and we are trying to use that kind of thinking as we work our way through this process.

Mr. THORNTON. We recognize that the problems are difficult and that what is required is a strong effort to overcome those problems.

Just in a footnote to history, might I ask, Dr. Hart, didn't we—while I was President of the University, didn't we announce in the Governor's Conference Room what was perhaps the very first example of industry, academia, and Federal Government cooperation under the Stevenson-Wydler Act?

Mr. HART. We certainly did, and that was the development of the concept of an international collaboration which had LC, and industry, and the University of Arkansas, and NCTR working together, and that was under your leadership, as president of the University of Arkansas.

Mr. THORNTON. I was just following. We wanted to participate. But I think the agency did an outstanding job in moving toward that effort.

Mr. HART. They certainly did.

One thing I would add to Sharon's comments, which I think is oftentimes lost in the concept of technology transfer, is that regulatory agencies, I think, have a unique opportunity to contribute perhaps more to technology transfer than most agencies in the fact that their research not only provides a new product, a new idea, or a new opportunity, but oftentimes because of the nature of the regulatory science and the field of regulatory science, their research will be very much focused on resolution of a regulatory issue, such as the example that Sharon just gave at this time.

Therefore, not only is a new product developed which has a potential marketplace both nationally and internationally, but also a regulatory problem is resolved, and by resolution of that problem not only is public health protected but you also have regulatory relief to American industry, and that is a double-edged positive sword which swings positively in both directions.

Mr. **THORNTON**. Thank you for that additional comment, and congratulations to you for the fine job that you are doing.

We also formed an NCTR Associated Universities Consortium patterned after the Oak Ridge Consortium which has been exemplary, I think, in moving technologies from the inventors' laboratory into the marketplace, and, Ms. Langenfeld, in the instance of labs that are managed by for-profit or a nongovernmental organization—for example, Oak Ridge—have there been any CRADA's with the parent organization—for example, Martin Marietta—and, if so, what procedure is used to ensure fairness of opportunity?

Ms. **LANGENFELD**. To date, we have not had any CRADA's involving a parent organization with a laboratory. Again, we have only been using the CRADA mechanism in our GOCO laboratories for a few months. In the case of Oak Ridge, for example, Martin Marietta signed the contract clause in August 1990 and signed their first cooperative agreement under the law in the December-January time frame of this year. So we don't yet have experience with handling a real situation. We have, however, anticipated those situations.

What we have done in the technology transfer contract clauses with each of these contractors, including Martin Marietta, is, we have established a set of conflict-of-interest principles or guidelines, nine points of issues to be concerned about, and one of those has to do with organizational conflicts of interest.

The parent corporations do not get preference. The obligation is on the contractor to ensure that, in making opportunities available, that they are made available to all interested parties, and if Martin parent corporation is an interested party, they would also be able to participate but not on any preferential basis, and so through those contract clauses again we have established an agreed upon set of procedures to ensure that we can mitigate the potential impacts of any kind of preferential or accusations of nonfair treatment of other parties.

Mr. **THORNTON**. Thank you.

Mr. Adler, with the fine new director, Bernadine Healy, I anticipate that efforts already good will become even better, and I want to congratulate you for your testimony, but I do have a couple of questions.

The National Competitiveness Technology Act contains a Freedom of Information exemption for certain trade secrets, and my question is whether NIH includes such an exemption in its CRADA, and, if not, why not.

Mr. **ADLER**. At the present time, NIH, for policy reasons that I will describe, believes that keeping the results of its scientific research secret is inconsistent with our overall mission to disseminate new knowledge to the research community. We have not found that this policy choice to have been an impediment in entering into CRADA's with companies.

I think that in the biomedical research area, the pharmaceutical and biotechnology companies with which we collaborate are accustomed to similar provisions from academia which also value academic freedom and the ability to publish research results.

Mr. THORNTON. Do you distinguish between trade secrets and patenting or copyright rights?

Mr. ADLER. Yes, we do. We encourage the results of the research to be published but permit a delay in dissemination of results to allow the filing of patent applications.

Mr. THORNTON. The reason I ask is that many people believe that it is the proprietary right for a period of time, as basically outlined in the Constitution of the United States, that is often the driving force for the dissemination of information, and I wanted to be sure that you were drawing a distinction between a trade secret or process that is not at all the disclosure process that we have in our patent laws.

Mr. ADLER. We distinguish between trade secrets and patentable inventions. We encourage, as I said, patent applications to be filed, and we encourage the licensing of these inventions.

I think one key advantage to a company that collaborates under a CRADA is that they develop a body of know-how or expertise with a particular technology that may derive some commercial benefit, but at the bottom line, if something is of interest to the academic or research community, we would expect to be able to publish those results.

Mr. THORNTON. Mr. Adler, one final question before relinquishing my time. How do you deal with the provision that I have discussed with Ms. Wince-Smith on the foreign companies utilizing the results of our inventions? Do you have safeguards?

Mr. ADLER. Yes we do, Mr. Chairman. The issue of foreign ownership is specifically reviewed for each CRADA that we process, and there are several check-off boxes even on the face sheet for the CRADA where we specifically try to determine whether a collaborator is a foreign or a domestic company.

We have a limited number of CRADA's that we have entered into with foreign companies, and in those cases there are particular public health reasons that make that project——

Mr. THORNTON. Can you provide us with an estimate, or can you give us later a listing of those or give us some rationale for those that exist?

Mr. ADLER. Yes, sir, I would be very pleased to submit that for the record.

[The information follows:]

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August 12, 1991

The Honorable Tim Valentine
Subcommittee on Technology and Competitiveness
B-374 Rayburn Building
Washington, D.C. 20515

Dear Congressman Valentine:

During the presentation of my oral testimony on May 30, 1991, Congressman Ray Thornton requested that the National Institutes of Health (NIH) submit certain CRADA-related information for the record. Pursuant to this request, the following shows the breakdown of CRADAs for NIH and the Alcohol, Drug Abuse and Mental Health Administration.

The following data is approximate; it has been drawn from a new data system being tested by my office. Of the approximately 143 CRADAs approved by the combined NIH-ADAMHA CRADA Committee, 130 were with domestic companies and 13 with foreign companies. Of the domestic CRADAs, 57 (or 44%) were with small businesses. Of approximately 180 patent license agreements negotiated on behalf of NIH and ADAMHA, 38 were exclusively (no foreign licensees), 15 were co-exclusive (no foreign licensees) and 127 were nonexclusive (with 5 foreign licensees). The definition of "domestic" from the FTTA was utilized, i.e., "business units located in the United States."

Please let me know if any additional information would be helpful.

Respectfully,

Reid G. Adler

Reid G. Adler, J.D.
Director
Office of Technology Transfer

Mr. **Thornton**. Ms. Horn.

Ms. **Horn**. Thank you, Mr. Chairman. I would like to just ask a general question of the panel.

I realize the legislation under which all these activities have been occurring is relatively recent—1986 amendments to a 1980 Act and then some additional legislation in 1989—and hearing those of you from various Federal agencies speak, everything sounds okay and ongoing and upbeat and effective and wonderful, and I am not here to say that all those things aren't true, but, on the other hand, never do we pick up a newspaper or listen to a broadcast or look at a magazine or any kind of other publication that we don't hear about what is coming out at the other end, or, I suppose I should say, what is not happening at the other end.

I want this to be constructive, and perhaps if you are prepared to give some ideas now or perhaps we could do this at a later date, as opposed to bringing people in to say they don't this, they don't do that, everything is too bureaucratic, the red tape is awful. You are the people probably in a very good position to know what we should be doing that we are not doing, whether there perhaps are legislative remedies or funding remedies or staffing problems, or I heard someone speak of the problems we have between discovery and commercialization, sort of pre-competitive versus getting the things out there.

If you could just, as an overview, state how you see your particular agency, your particular labs, what you think your needs are. The GAO data is perhaps a little dated, and also their recommendations we all have access to. If you choose to organize any response around their recommendations and how you might elaborate on them or dispute them, that would be fine, too.

Ms. Wince-Smith, would you want to start there, please? Thank you.

Ms. **Wince-Smith**. Thank you.

I just want to make sure that I understand your question, and that is the role and importance of Federal labs in the competitiveness issue, or were you addressing more broadly the overall technology competitiveness——

Ms. **Horn**. I am just talking—yes, the role of the labs in the technology transfer, absolutely.

Ms. **Wince-Smith**. All right. Because I would just like to start out by saying that in terms of the overall competitiveness challenge we face and the role of technology. One of the concerns that is clearly at issue is that we have to have in the United States closer industry-led partnerships between the producers and users of technology. And a lot of the things that we are trying to encourage in the Federal labs in a philosophical sense is this concurrent engineering approach I alluded to earlier is very relevant to the private sector as well, and that gets at the heart of not having these isolated activities that are divorced from each other.

In terms of some very specific things, one of the issues that we have been aware of very much in the Commerce Department is—and that pertains to small and medium size firms—if you are a small or medium size firm and you want to find out what is going on in the Federal labs, how to get engaged, you immediately face an incredible situation of how to get the information on where to go, how do you know what kind of superconductivity research is being done at Oak Ridge or Los Alamos, or what R&D is going on in the NIH facilities.

Clearly, through our National Technical Information Service, we are playing a role in that. One of the things we are trying to do is update and expand the Federal Research In Progress data base which tracks Federal R&D, and I think we need some mechanisms to provide a kind of a one-stop shopping service for U.S. industry to know where to come and find this information and to do the brokering. I mean we are trying to do this in Commerce on a small scale, given our resource situation, and I know Secretary Watkins has referred to Commerce as the potential marketing arm for the DOE's labs to help with that kind of interface with the industry that needs the technology, the user needs that we heard about on the earlier panel.

The other area that is very, very important is training, and we have the Federal Laboratory Consortium that has been established by law. We in Commerce believe that is an important entity, but it needs to be upgraded. It needs to involve the senior managers in the labs in a very, very strong way, and that currently is not the case. It is a much more down in the systems operation, and, as I said earlier, we need leadership at the top, at all levels. We need to upgrade that Federal laboratory consortium to provide the training, to get the full economic benefits from the Act.

Thank you.

Ms. **Horn**. Thank you. That was a very helpful response.

Just last week, we heard comments on a proposal to do—in biodiversity, to establish a centralized data base, and you are indicating the same thing is needed here, a centralized data base that would take information that is perhaps available in the various labs, and you said the one-shop stop—one-stop shopping. Perhaps you could elaborate on that just for one more minute.

Ms. **Wince-Smith**. I can elaborate in a personal sense that kind of brings it home. I am an archeologist by training, and I have an archeologist friend who is now the CEO of a $40 million small company in the area of computer graphics. And when she visits me she said, "Well, you know, I want to plug into the national labs, you know. Where do I go? How do I do it?" And I start telling her about what is going on in DOE and in the National Science Foundation, and she said, you know, "How can I, as a CEO, go to every one of these departments and agencies and find this out? It's impossible." And that is, you know, clearly the case. And so the response is, it is too overpowering, you know, we don't have the staff, we don't have the resources, and I can visualize a kind of entity where we could perform that.

Now if you look at the Japanese situation, they have, you know, this organization called JETRO that has—that is connected with MITI, that is an information-gathering operation with hundreds of people employed by JETRO. I am sure that they are getting to Japanese industry more information, more timely, on what is going on in our Federal laboratories than we have any capability to get to U.S. industry, and that is an issue of priorities and organization and all the other.

Ms. **Horn**. Thank you.

Perhaps—I see some people nodding their heads on that. I asked this question at the biodiversity: Are we going to have a lot of turf battles and protectiveness amongst labs and agencies if we decide we need to share and have a data base that would be centralized? Is that going to be a problem?

Ms. WINCE-SMITH. We already have, you know, a data base—you know, the Federal Research in Progress—but it needs work on it, but I think maybe some of the other agencies might want to answer that. I can't imagine there would be a turf problem, but maybe they should answer that.

Mr. HART. Relative to your question, Congresswoman Horn, I really don't—most of the Federal agencies, institutes, and centers, as a Center Director, have such specified missions and mission statements that, really, we prosper by sharing information and by communication rather than worrying about turf and turf protection. That might be the case if we had unlimited resources and we could overlap with each other better, but, unfortunately, we do not have unlimited resources, for some strange reason. It would be nice to experience that, but, unfortunately, that is not the situation.

Another point I would add to Deborah Wince-Smith's statements—and I think her comments are very, very correct—is that, for some reason, we have not been as successful as I had hoped we would be when I helped draft the initial Technology Transfer Act of 1986, several years ago. We have not been as successful as I had hoped we would be in communicating with industry, and industry has not been as receptive as I had hoped they would be at that time either, and so there is a culture barrier that we have to address in that regard as well. It is not all within Government it is also out, external to Government.

Mr. THORNTON. Thank you for those observations. Dr. Hart.

Ms. Horn.

Ms. HORN. Yes. To follow up on that, Dr. Hart, we have heard people talk about this culture in other references. The communication with industry and industry not being receptive—are you seeing this—are you dealing with larger companies, or the problem is getting information out to small and medium size. If you could elaborate on that, thank you.

Mr. HART. About three weeks ago, I gave a keynote address at the Society of Organic Chemical Manufacturers Association, which represented the CEO's of the 200 organic chemical manufacturers in the United States, including those owned by foreign national—foreign corporations.

I asked during my presentation how many of the people in the audience had actually heard of the Federal Technology Transfer Act and were familiar with what was involved in that Act. Only a dozen hands raised in the audience. Knowing most CEO's of most chemical corporations, they are not usually shrinking violets, so if they know something, they normally try to let everyone know that they know something.

I'm not sure if that came out quite the way it was meant to, but that seemed to be the situation.

Interestingly enough, of those dozen or dozen and a half hands that raised at that question, six of them were from corporations which were owned by foreign corporations.

Ms. HORN. Does anyone else have a comment on my original question?

Yes, I see Ms. Langenfeld has.

Ms. LANGENFELD. Thank you. I have actually been saving up comments on all of your questions, so, if you will bear with me——

Mr. THORNTON. Please continue and answer all of them. Just let us know which question it is that you are answering.

Ms. LANGENFELD. I will do so.

I believe your original question had to do with: "Sounds good; we're out here being advocates and champions, but the results don't seem to be there. What's coming out at the end of the pipeline?" I want to comment on that for a minute, because you also went on to ask, "What do we need to do to make those results happen?"

I think it is safe to say that the present results, if you look at them, probably don't reflect the opportunity that we are trying to tap into. We do believe there is much more in the laboratories as well as, in DOE's case, our production facilities that can be effectively transferred to industry and help U.S. competitiveness.

The thing to keep in mind, from my point of view, is that technology transfer, even within a company, is not a rapid process nor always a successful process, and when we start talking about it between organizations, particularly organizations like the laboratories, who are doing very long-term high-risk research, the type of research that we do in our laboratories is 10, 20, 30 years out in the horizon before it is going to be a commercial success. We are looking at a point in time of 10 years of the Stevenson-Wydler Act, five years of fairly active implementation of that Act through the FTTA and the Executive Order, and we are just now starting to see the fruits of what happened in the early years.

I think what we are describing here is an increased level of commitment and focus, better systems in place to allow those activities to take place, and I think we are going to start seeing the numbers continue to grow and, in fact, dramatically increase, particularly now that we have opened up many of the DOE laboratories to greater cooperation, and we are going to be working at DOE to look at how we better measure that success, not just measuring what we put into it but also trying to get a better handle on what we measure to get out of it.

You also talked a bit about the problem of bringing industry into the labs and trying to make better outreach or reaching out to industry, as we started to refer to it. We do participate with the Department of Commerce in FEDRIP, and we are working with them to try to find ways to get more of DOE's information onto that system.

We are also working with the National Technology Transfer Center, which Congress authorized and is under NASA, who is looking at other ways of potentially providing services to potential industrial customers to help them find things in the laboratories.

The Federal Laboratory Consortium is also an important element in trying to make matches between companies and the laboratories and DOE facilities.

So there are a number of things out there, and we, as Dr. Hart pointed out, are not shy about leveraging our funding with other people's funding and trying to get more bang for the taxpayers' dollar in this endeavor. So we are looking at a number of innovative, new ways to do that.

One of the interesting things we are finding in the last few months as the implementation has taken off is the creativity of our laboratories in responding to the new authorities. Martin Marietta, for example, produced a videotape of CRADA opportunities, explaining what a CRADA is, including the information protection provisions, and they did this with the royalty monies that they have received for other inventions that they have licensed. They have had an overwhelming response to the videotape. They sent it out to CEO's of many corporations and are getting more requests than they are able to handle right now for potential cooperation.

So the potential is there. It does take dedication and commitment, and I think the reason we are all such advocates is, if we can communicate the positive story, others will follow and we will finally make that cultural change happen.

Thank you.

Mr. **Thornton**. Ms. Horn——

Ms. **Horn**. Did anyone else—yes, we are running out of time, Mr. Chairman. Okay.

Mr. **Thornton**. Before we ask Mr. Adler for his comments with regard to your question—and I would be very eager to hear them, as I am sure you would be—I have been told that two or three of our witnesses are already running up against a difficult scheduling problem, and so, Mr. Adler, if you don't mind remaining at the table for a minute, I am going to excuse the rest of our witnesses and let them go about their business.

Is that all right with you, Ms. Horn?

Ms. **Horn**. Sure.

Ms. **Holston**. Mr. Chairman, thank you very much.

Ms. **Langenfeld**. Mr. Chairman, thank you, and members of the subcommittee.

Mr. **Thornton**. Mr. Adler, you have got it all to yourself now.

Mr. **Adler**. Thank you for this honor, sir. I also will be very brief.

As to sharing of information and data bases and turf battle concerns, I think, in reality, that may be unlikely to occur. At the moment, there are a number of different data bases within agencies, also within the National Technical Information Service, as well as some private vendors who are offering data services that will provide surveys of academic and Government research interests, and inventions available for licensing. At NIH, we are very eager to participate in every data base that we learn about.

One of the first witnesses this morning talked about technology transfer as a body contact sport. It is also, in more pragmatic terms, a marketing exercise, and I think spreading the word in many different ways is important to a successful technology transfer effort.

I would note also that the product development horizon for pharmaceutical compounds, for instance, is three to ten years once a product, a potential product, has been isolated and characterized at the research bench level, and it is still too early to see on the market many pharmaceutical products that are under development through CRADAs entered into since enactment of the FTTA. And the last point I would like to make is that there are some lessons for Government technology transfer to be learned from the academic experience which had essentially a six-year head start following enactment of the Stevenson-Wydler Act preceding the FTTA's enactment, and, looking at the technology transfer literature, it seems like many academic centers needs about five to ten years—and it varies—to develop a very mature, stable technology transfer program.

Some of the interagency committees that Deborah Wince-Smith talked about and more informal networking, I think, are helping Government laboratories shorten that lag time, or learning curve, that she referred to, and I think the FTTA is extremely flexible. We are very optimistic about our programs, but it is an evolving process for every laboratory, and I think to some extent we need to be patient.

Ms. HORN. I appreciate that. That was helpful.

Are you suggesting that the data is out there and it is just a matter of not—of small, especially small and medium size companies not knowing where to go to get it, or do you think a lot is out there in various places and various data bases; it is just, they don't know where to go to find that?

Mr. ADLER. I wasn't attempting to suggest that the data is already there just essentially ready for the plucking. However, there is a great deal of information in a number of different data bases. I think one of our real concerns is how to let people know that Federal labs transfer technology and are good collaboration partners, and I think there is a great deal yet to be done in making raw data available but also in spreading the word that the program exists.

Ms. HORN. Just that they exist. That certainly seems to be in line with what Dr. Hart had said.

Thank you very much, Dr. Adler. Thank you for your patience.

Mr. HART. Thank you.

Mr. THORNTON. Thank you, Ms. Horn.

All of the witnesses will, from previous assurances, be willing to respond to written questions from the staff, and I am sure that you will be willing to do so, Mr. Adler.

Mr. ADLER. NIH would be very pleased to cooperate, sir.

Mr. THORNTON. Thank you very much for your testimony. I thank all of the panel.

The best we saved for last. I have read the excellent testimony being presented by the Agriculture Research Service: Dr. William Tallent, Assistant Administrator; and by Dr. Ronald Culpepper, who is the Director of Independent Research and Development for the United States Office of Naval Technology.

Gentlemen, you are welcome to the hearing. I have had an opportunity to read your prepared testimony, and, without objection, it will be included in the record verbatim. I would like to ask at this time that you summarize that testimony for us.

Dr. Tallent.

STATEMENTS OF DR. WILLIAM H. TALLENT, ASSISTANT ADMINISTRATOR, AGRICULTURAL RESEARCH SERVICE, U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON, DC; AND RONALD CULPEPPER, DIRECTOR, INDEPENDENT RESEARCH AND DEVELOPMENT DIRECTORATE, U.S. OFFICE OF NAVAL TECHNOLOGY, ARLINGTON, VA

Dr. TALLENT. Thank you, Mr. Chairman and Members of the Subcommittee. I am pleased to be here to discuss this important issue.

I am the Assistant Administrator of the Agricultural Research Service, which I shall call ARS, one of two agencies within the Department of Agriculture most intimately involved with implementation of the Federal Technology Transfer Act of 1986.

The Forest Service also has a Research Division, and that division is actively involved in the implementation of the FTTA and carries out activities similar to the ones that I will summarize for the Agricultural Research Service.

The Federal Technology Transfer Act of 1986 is the foundation of our technology transfer to industry program. For our purposes, two provisions of it are particularly important. First, CRADA's, implemented under the authority of the Act, give industry cooperators the right of first refusal to exclusive license to inventions made under the agreements. Without this kind of protection, industry is not particularly interested in spending the kind of money they have to spend to develop and market a new technology and then have someone else come in and move into the field without some patent protection.

Secondly, in carrying out these agreements, CRADA's, ARS scientists are authorized to work as closely as necessary with private firms to help them commercialize technology based on the scientists' research. This represents a major change in policy and philosophy. Before the FTTA, our scientists worked with trade associations, or groups of industrial firms, but they tended to keep an arm's length relationship with individual companies.

My prepared statement summarizes the things we have done to familiarize ARS scientists and industry with opportunities for CRADA's. We have distributed some pamphlets, I think, and I would just mention that two of them have very similar titles, referring to technology transfer agreements. One of them, with the black print, is for our own in-house scientists, and the other one, with the green title, is for industry—potential industry cooperators, a slightly different thrust in those.

Also, I want to point out that, in order to simplify the agreement process, we have developed a generic CRADA, a standard CRADA, into which the parties—that is, the ARS and the industry scientists—need only add an outline of the proposed research. This puts the action in development of a CRADA at the scientist-to-scientist level where it belongs.

You asked for our reaction to the GAO report, and overall we in Agriculture think it gives the impression that the law is working pretty well, and we agree that it is. Maybe it is a matter of whether you see the glass is two-thirds full or one-third empty.

But given the complexity of the issues it addresses, progress is impressive. There is marked increase in industry-Government laboratory cooperation, and there are some products beginning to come out the end of the pipeline, four or five already in Department of Agriculture CRADA's. There will be more, as was indicated earlier.

Some major ingrained barriers make successful technology transfer not a simple operation. Two of these have been mentioned. Cultural difference has been discussed quite a bit this morning.

Secondly—and this has also been mentioned—there is a gap between where scientists in a research lab are willing to carry or normally carry a piece of research and where industry is willing to pick it up. Mr. Kuper of MTI referred to this. And in regard to the latter, I would like to comment on one specific sentence in the report. And the copy I have is a xerox, and I don't know if the pagination is the same as what you all have or not, but on my copy it is on page 79 in a paragraph entitled, "Opinions on Work-Related Effects," effects of the FTTA, and the last sentence in that paragraph reads, "Also, 21 percent of USDA's laboratories responded that the focus of laboratory research is more on innovations with commercial application."

Mr. Chairman, to make sure that a CRADA fits our legislative mandated mission and priorities, we have every CRADA reviewed by our national program staff so that CRADA's are not really distorting our program from the mission for which the funds that ARS operates under were appropriated. However, I hasten to add that only two of the 200 CRADA's that we have negotiated were rejected by the National Program Staff, and one of those was approved after some revision.

This brings me to an often overlooked aspect of the Federal Technology Transfer Act. A major benefit of the Act for the Agricultural Research Service that is difficult to quantify is the interaction and rapport that develops between ARS and cooperating industrial scientists. This interaction generates feedback to the ARS scientists on the scientific gaps that need to be filled to facilitate commercialization of new technologies. Such feedback is factored into ARS program planning and helps to guide the agency's research to achieve better complementarity between scientific and technical activities in our laboratories and in the private sector, an element of market pull a la Congressman Henry, if you will.

Finally, even though the Federal Technology Transfer Act provides valuable tools for technology transfer that have proven to be effective, there are still some impediments to maximum realization of its potential benefits. These are listed in my statement, and I am not going to go into them all. They are approximately the same as listed in the GAO report. I will single out one, and that is the inability to copyright software by Federal scientists. Of the 200 CRADA's that we have implemented, none is on software, and that is in spite of the fact that systems research and the associated software development is a major program in the Agricultural Research Service. And we feel very strongly that systems, and software, and expert systems have major promise in the agricultural economy.

Secondly, it is unfair to the scientists doing this kind of systems research in that they can't—their work can't be protected and they can't get this award that patent scientists who make inventions that get patented are able to get.

Mr. Chairman, this completes my remarks. I will be pleased to respond to questions at the appropriate time.

[The prepared statement of Dr. Tallent follows:]

STATEMENT OF DR. WILLIAM H. TALLENT, ASSISTANT ADMINISTRATOR FOR COOPERATIVE INTERACTIONS, AGRICULTURAL RESEARCH SERVICE, U.S. DEPARTMENT OF AGRICULTURE

Mr. Chairman and Members of the Committee, I am pleased to be here today to discuss this important issue. I am Assistant Administrator of the Agricultural Research Service (ARS), one of the two agencies within the Department most intimately involved with the implementation of the Federal Technology Transfer Act (FTTA). The Forest Service is also actively involved in implementation.

The Agricultural Research Service, the main inhouse agricultural research agency of USDA, has been delegated authority to implement the FTTA. Major activities in technology transfer are conducted through: (1) direct communication between scientists and users; (2) involvement of users and potential users in research planning and evaluation; (3) cooperative research and development agreements with commercial firms; (4) direct transfer of new ARS research findings via computer to industrial firms, action agencies, The National Technical Information Service, state extension services, the National Agricultural Library, and State and local governments; (5) patenting and patent licensing; (6) research reporting by ARS information staff; (7) participation in and support of the programs of the Federal Laboratory Consortium for Technology Transfer; and (8) marketing of new ARS technologies via technology transfer meetings and electronic and print media. The Forest Service also has delegated authority to implement the FTTA. The activities summarized below for ARS could equally be made using forestry research as an example.

Among these activities, ARS is emphasizing Cooperative Research and Development Agreements (CRADAs) with industry and patenting and patent licensing. CRADAs implemented under the authority provided by the Act give industrial cooperators the right of first refusal to exclusive licenses to inventions made under the agreements. Also, in carrying out these agreements, ARS scientists are authorized to work as closely as necessary with private firms to help the companies commercialize technology based on the scientists' research. To inform and assist scientists in finding industrial cooperators and developing CRADAs with them, the ARS Office of Cooperative Interactions (OCI) has developed informational brochures and a videotape. Members of the OCI staff make presentations on the FTTA and CRADAs to scientists at ARS laboratories and Research Leader meetings.

As a result of these efforts, the number of patent applications and patent licenses are projected to increase by 13 percent in FY 1991 over the past year (FY 1990). Cooperative Research and Development Agreements are increasing at the rate of approximately 25 percent per year. Also continuing to increase is the number of industry firms and other users making direct access to ARS research findings via the computerized TEKTRAN system. The attached Table (Attachment 1) gives specific data concerning the ARS technology transfer program. Agency policy is to award scientists twenty-five percent of revenues from licensing patents of their inventions. Accordingly, nearly 100 ARS scientists will receive licensing revenue-based awards totalling $212,000 this fiscal year. In addition we have implemented the ARS Technology Transfer Awards Program, the first of its kind in the Federal Government. We will make awards to scientists of $11,500 in its third year of operation. Outstanding contributions of Technology Transfer will continue to be recognized and rewarded.

At least as important as these awards is the impact of technology transfer activities on scientists' careers. ARS has issued guidelines instructing that such activities be considered by peer panels evaluating scientists for promotion.

ARS scientists are expected to make more than 75,000 contacts with users and user groups in FY-1991 to facilitate transfer of technology developed by the Agency. For example, industry personnel will have an estimated 20,000 contacts with ARS scientists in FY-1992. Many technology transfer meetings (including open houses, field days, etc.) are held by ARS laboratories every year. ARS also participated in the National Biotechnology Technology Transfer Conference sponsored by the Department of Commerce on July 10, 1990, in Washington, D.C. The ARS also participates regularly in technology transfer conferences sponsored by the Federal Laboratory Consortium. Other formal meetings of this type where ARS technology is exhibited include those held by trade and professional associations.

ARS carries out concurrent efforts to transfer technology in the normal course of communicating research results to the public. Frequently using TEKTRAN summaries as a starting point, our science reporters obtain further information from scientists and write news releases, articles for Agricultural Research Magazine, short items for the Quarterly Report to Congress and the annual Research Progress Report, radio and television news features, speeches for ARS and USDA leadership, and a quarterly roundup of reports of special interest to business and industry. All such stories are sent to media and industry contacts who have indicated in writing that they want to receive them.

Another component of the ARS technology transfer program is the Agency's involvement in the Biotechnology Research and Development Corporation (BRDC). This consortium is based on cooperation among the ARS National Center for Agricultural Utilization Research, The University of Illinois Biotechnology Center, and six industrial firms. The $1.8 million per year invested in the consortium by ARS is more than matched by the six companies and the State of Illinois.

A major benefit of the FTTA that is difficult to quantify is the interaction and rapport that develops between ARS and cooperating industrial scientists. This interaction generates feedback to the ARS scientists on the scientific gaps that need to be filled to facilitate commercialization of new technologies. Such feedback is factored into ARS research planning and helps to guide the Agency's research program to achieve better complementarity with scientific and technical activities in the private sector.

Even though the FTTA provides valuable tools for technology transfer that are proving to be effective, there are still impediments to maximum realization of its potential benefits. One of these is our inability to copyright computer software. This inhibits transfer of computer based modeling technology. Another impediment is the contradiction between the FTTA and conflict of interest laws. Strict interpretation of these laws proscribes involvement in a CRADA by a scientist holding a single share of common stock in the industrial cooperator. Still another negative influence on realization of the full benefits of the FTTA is the lack of aggressive protection of U.S. patents against infringements.

In our experience, the mandate of the legislation passed by the Congress to facilitate technology transfer is being successfully carried out and has proven to be a useful tool to Federal agencies in getting the results of their research into the marketplace. Some finetuning to address the impediments just mentioned would help make the program even more successful.

Mr. Chairman, this completes my prepared statement. I will be pleased to respond to any questions.

Mr. THORNTON. Thank you very much, Dr. Tallent.

In the Department of Agriculture, you have the opportunity of sitting side by side with what is probably the best device ever used to disseminate technology and information in the Cooperative Extension Service.

Dr. TALLENT. That is right.

Mr. THORNTON. And so much depends upon the trust that the recipients of the advice may give to the quality of the advice. You have the agriculture community in that Cooperative Extension Service example ready to accept what your research leads to.

Dr. Culpepper.

Dr. CULPEPPER. Good afternoon, Mr. Chairman. I am pleased to appear before you to describe the Navy's Technology Transfer Program. I would like to describe that particular program in terms—describe the system the Navy has set up for that effort, to give you a status report on our progress, and then finally to make some recommendations for legislative improvements.

Mr. THORNTON. Good. We look forward to your testimony.

Dr. CULPEPPER. Thank you.

Under the current Government contracting policy, a contractor has the right of first refusal for commercial application of technologies developed under contract research and development. That means in the case of the Navy that approximately 85 percent of our projects already have their commercial rights spoken for, because that is how much we spend—that is how much of our program is done in commercial laboratories and corporations. Of course, the Government in that situation retains a royalty-free use privilege, but it still means that the commercial rights are not ours to grant.

In the case that is licensing Navy developed, or Navy owned and contractor developed, programs where the contractors have chosen to waive their intellectual property rights, the Navy has very long had an active program. The latest Navy instruction reaffirms the designation of the Chief of Naval Research as the responsible agent for patent licensing but also calls upon all of the Navy R&D laboratories to participate in the marketing of such products.

In the case of CRADA's, we have a two-tiered system in place. For those research and development activities that have demonstrated the ability to develop and negotiate CRADA's, they will be delegated the authority to enter into such agreements on their own with a post-review process. For those smaller laboratories, where they generally don't have the opportunity to do this as a more or less course of common business, we would have them come to us for review rather than having them develop their own expertise locally. We turn those around within the 30-day period and send them back out in such a way that they can either sign them if we have found them appropriate or else modify them and sign them after that modification.

Our program is designed to try and provide as much latitude as we possibly can to the laboratories in the development of those CRADA's, and I must say in passing that our laboratories have, in fact, been very, very innovative in their use of these things.

The Navy team is in place, it is operational, and our DON engineers and scientists are aware of the Domestic Technology Transfer Program and its applications and advantages. We have at the moment 33 royalty-bearing licenses. We collected last year $137,000 in royalties. Of that, $41,000 went to our inventors. We also have well over 100 nonexclusive, nonroyalty-bearing licenses, but those still are transferring the technology that was developed in the Navy laboratories.

Our ORTA system serves as our marketing arm. We have asked that our ORTA's serve, because they are intimately familiar with the products and the technologies that are being developed in their own individual laboratories, that they serve as the spear point, if you will, in terms of marketing our products, our technologies, to private industry, and they are in place in doing that particular function.

We have an active infrastructure. It meets several times a year to discuss particular problems we have—The Defense Technical Information Center serves as our reference library. All our scientists, when they write the reports that are furnished, generally finalize a research project. They are stored in DTIC and are available either to industry through their normal Government contract programs or through the Navy Potential Contractor Program. We have a mechanism in place where they can ask us for entry to certain parts of those data so that that can be made available to them.

We also have a fact sheet with a readers list of about 8,000 that we distribute monthly to identify those particular kinds of technologies that we think have been—are appropriate for dissemination to the community, for the industry to come back and ask us about.

Our licensing program remains in place, but we have shifted emphasis in recent years towards granting significantly more exclusive licenses. Up until recently, our license was sort of like a Texas barbecue; it was, "Y'all come, and we'll just give it to anybody on a nonexclusive basis." That doesn't really help industry very much, because they are afraid someone else will pirate something that they have gone to the trouble to develop commercially, so we are having to grant exclusive licenses.

Our patent applications and patents are at a five-year high. We have 33 ongoing CRADA's. We have probably another dozen in the final stages of preparations, and, because of our decentralized system with the laboratories out there preparing them before we know about them, I can't tell you how many are in the laboratory stage.

We have just recently completed our first CRADA's with the Naval Research Laboratory. They had a product with the—a project with the Electric Power Research Institute where they were looking into the causes of breakdown in high-tension insulation—high-tension-wire insulation, and they have discovered that; they have discovered some very interesting things that should, in fact, in the future, lead to a better and longer-lifed high-power wires so that they won't have to be replaced.

The ones that are in operation right now are very diverse. We have one in submicron lithography for integrated circuits; we have a new one that is based on biology to determine the toxicity of oil well drilling wastes; we have licensed some of our simulation technology for teaching programs. This is just three or four of some of the more interesting ones that—they are all over—because the Navy has such a diverse technology program, our CRADA's have a tendency to cover a very wide spectrum of activities.

We have not gone the route of a "fill in the blank" CRADA process. We wanted our particular people to use their innovation to come up with—to tailor the ones that are appropriate to their particular situations, and they have done that.

I think it is of interest to note that, of our 33 CRADA's that are ongoing right now, they are from 16 different activities. They are from some of our major laboratories and some of our minor laboratories; they are about equally mixed. The process is still young, it is growing, and we have every reason to believe that it will continue to grow into the foreseeable future.

There are some problems, however, and we would like to come to those. We have difficulty with our lack of ability to copyright. Some of our most important products, some of the things that we could sell quite easily, are, in fact, computer software, and without that copyright protection the companies just flat out aren't interested in buying it from us.

We also need a truly effective way of matching our Government-developed technology to commercial needs. We haven't really come to grips with that. There are data bases out there, but I am still hunting for my customer list, and I haven't been able to find it at the moment.

We also would like to have specific authority to give brokers a percentage of the licensing royalties. The current legislation, according to the interpretation of the Navy lawyers, allows us to give them flat fees, but we are not allowed to share royalties with them, and we feel that that would be an enticement to the brokerages.

The current increase in patent and patent maintenance fees by the Patent Office is also causing us difficulty. The Navy budgets have not been expanded to cover that, and the result is that we are losing our patents to nonpayment of fees, and so we are decreasing our sales—our product, if you will, the stuff that we are trying to sell on our shelves.

We also have run across the situation that, in the last few years, that much of the technology that we would transfer isn't covered by patents, it is know-how, it is technical know-how, and it is very difficult for us to be able to get that into the marketplace. We need some sort of a mechanism, and I don't have a good suggestion in this particular area, but we need some sort of a mechanism that would allow us to transfer the nonpatented, or nonpatentable in many cases, technology know-how that we have. We need specific authority to pass title to pieces of various equipment to industry as part of the tech transfer process.

We have a case in point right now where one of the CRADA's that is being developed would require us to transfer title to some surplus rocket engines, and we don't seem to be able to find the authority under the present legislation to do that. We can lend it to them, but we can't give it to them under the situation. At least that is the interpretation of our particular lawyers.

Another item of concern is fairness. I am a child bride of the Navy system. I have been around it for 38 years. I grew up in a contracting system that made absolutely a fetish out of being absolutely fair to all concerned. The tech transfer laws give us some latitude in this particular situation, but our laboratory directors are uncomfortable with that latitude, and they would like some rules and regulations in that particular respect. How far do we have to go in advertising the technology before we can partner up with someone to commercialize that particular technology?

We also need some way to incentivize industry to buy our technology. I have been trying for now five years to sell—we have had technology fairs, we have brought our inventors out there to meet industry, we have tried to canvass local areas for their small inventors, and I have still not been able, through any of those processes, to be able to convert any of our inventions into a patent license or anything of that nature. Generally, it just doesn't work. I have got to have a better way.

I have heard many of my associates talk about technology transfer being a body contact sport, and, in fact, it is at this particular time. It is my belief that, unless we can get past that, if we can get to the place where this thing is organized sufficiently that we do not have to spend an inordinate time on being a body contact sport, we will have a much, much more effective kind of a mechanism, and that is what we have got to look for.

In summary, the DON views the domestic technology transfer program as having the following benefits and characteristics. It allows an avenue to reward some of our more creative engineers and scientists and thus aids in our recruitment of those. This is a privilege that frequently is not given to those people in private industry where they are allowed to share in the patents and royalties of their particular inventions, and so we are starting to use this in some of our recruitment campaigns as an enticement for them to go to work for us vice—private industry. It provides a way to have DON develop technology quickly into the commercial.

Now, as you heard before, "quickly" may be a little bit of an exaggeration, but at least it gives us an avenue that we didn't previously have, and it provides a unique vehicle for allowing industry to use some of our unique capabilities. At least the Navy, and I am assuming other Government laboratories, have some very unique kinds of R&D laboratories that are not duplicated and wouldn't be duplicated on a cost basis with private industry but, in fact, do—through this process, we can allow them to use them.

We have one particular private organization trying to determine how much G's—how many G's a private pilot can withstand in one of our large human-rated centrifuges in the Navy. They couldn't afford to do that on their own, but we can help them in those sorts of things. So it allows us a vehicle that we didn't have before to allow them into some of our unique facilities.

The process is young. We expect it to continue to develop. It hasn't really even hit its teenage years yet. But we do expect it to be very, very interesting and useful in the future.

[The prepared statement of Dr. Culpepper follows:]

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COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON TECHNOLOGY AND COMPETITIVENESS

STATEMENT OF

DR. RONALD M. CULPEPPER

DIRECTOR, INDUSTRY IR&D DIRECTORATE

OFFICE OF NAVAL TECHNOLOGY

CHIEF OF NAVAL RESEARCH

BEFORE THE

SUBCOMMITTEE ON TECHNOLOGY AND COMPETITIVENESS

OF THE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

ON

FEDERAL TECHNOLOGY TRANSFER

30 MAY 1991

NOT FOR PUBLICATION UNTIL RELEASED BY THE
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON TECHNOLOGY AND COMPETITIVENESS

DR. RONALD M. CULPEPPER
DIRECTOR, INDUSTRY IR&D DIRECTORATE
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CHIEF OF NAVAL RESEARCH

Dr. Culpepper is currently the Director of the Industry IR&D Directorate at the Office of Naval Technology. He is charged with developing and managing the technical evaluation process of the Navy IR&D Program, maximizing communication between the Navy and private industry and expanding the DOD technology base and corporate technical expertise. He is also concerned with developing policy, plans and procedures for Navy technical participation in the IR&D program and for interaction with the industrial IR&D technology base structure. Other responsibilities include the development and implementation mechanisms for providing industry with Navy guidance and planning documents and information, and the development and implementation of process and procedures to coordinate the IR&D program with the Navy RDT&E structure.

Dr. Culpepper's previous assignments include tours as Director of Planning and Programming for the DON Exploratory Development Program, as Head of Performance Assessment and Analysis Branch of the Combat Systems Department of the Naval Surface Weapons Center, and as Head of the Laser Irradiation Vulnerability Team for the Navy HEL program. He has also served as the NAVMAT coordinator for the SEACON War Game.

Dr. Culpepper has more than 30 years of Navy R&D experience, having worked as a research physicist, weapons component engineer, weapon systems engineer, and operation research analyst. He has worked on SLBM fuzing, the High Energy Laser project, conventional warheads for guided missiles and nuclear effects testing.

He has degrees in mechanical engineering, physics, and nuclear engineering, and is a graduate of the Washington extension of the Naval War College.

DR. RONALD M. CULPEPPER
DIRECTOR, INDUSTRY IR&D DIRECTORATE
OFFICE OF NAVAL TECHNOLOGY
CHIEF OF NAVAL RESEARCH
TESTIMONY BEFORE
UNITED STATES HOUSE OF REPRESENTATIVES
SUBCOMMITTEE ON TECHNOLOGY AND COMPETITIVENESS
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

30 May 1991

INTRODUCTION

Good Morning. I am pleased to appear before you to describe the Navy Domestic Technology Transfer Program. I'll describe the system the Navy has set up for this effort, give you a status report on our progress, and finally make some recommendations for legislative improvements.

It is important to keep in mind the context in which the Navy conducts research and development (R&D). The products of such R&D are systems intended to enable the U. S. Navy to both defeat a numerically superior force in a combat environment and to carry out its peacetime mission of presence. Navy R&D is also intended to keep us abreast of advances made by potential adversaries so that we can counter such advances in our planning and strategy development.

Experience has shown that, even though such research and development was not intended for civilian products, there are considerable benefits and applicability of the developed technologies to private-sector goods. Such applications can and have resulted in products that either provide new capabilities or present capabilities less expensively. Such yields obviously help the country by raising the standard of living and by providing goods for international trade. The Navy has long recognized such benefits. Navy laboratories were among the founding fathers of the Federal Laboratory Consortium (FLC), one of the principal players in domestic technology transfer activities. The Navy has long had an active program for licensing its patents and technology. We believe in the benefits of domestic technology transfer.

The current Department of the Navy (DON) program has taken this previously existing involvement and modified it so that it is consistent with the new laws, while at the same time attempting to avoid making the Navy vulnerable to having the transferred technologies exploited by our potential adversaries. Additionally, while moving appropriate DON technology efficiently and effectively into the market place, we want to maximize the licensing fees that would come to the DON activities responsible for the technology development.

I'll describe the system we believe does all of this, give you the current status, and then finally outline what we think should be done on a national level to expedite the process.

THE NAVY DOMESTIC TECHNOLOGY TRANSFER PROCESS

Under current government policy, the contractor has the right of first refusal on the commercial application of technology developed under a contract. Thus about 85% of all Navy R&D programs have the resultant commercial rights "spoken for." Of course in these cases the Government has a royalty-free use privilege. In the current situation, the technology that the Navy has available for commercialization is restricted to that developed in its own laboratories or what a contractor chooses not to patent.

There are two main aspects to the commercialization of Navy-developed technology: (1) the licensing of technology developed solely in the Navy Laboratories or contractor-developed technology patented by the Navy; (2) the cooperative development of new technology through Cooperative Research and Development Agreements (CRDAs). In the case of licensing Navy-developed or Navy-owned/contractor-developed technology, as I said before, the Navy has long had an active program. The latest Navy Instruction on the subject reaffirms the designation of the Chief of Naval Research (CNR) as the responsible agent for patent licensing, but also calls on all Navy R&D laboratories to actively market the products of their Navy employee efforts. In the case of CRDAs, a two-tiered system is in place. Those research and development activities that have demonstrated the ability to develop and negotiate CRDAs will be delegated the authority to enter into such agreements on their own. The agreement would then be forwarded to the CNR for post-signature review to assure that the activity should continue to retain the delegated authority. Those organizations that have not demonstrated such abilities (generally those less active in technology transfer) would forward the signature-ready agreement to the CNR for review, approval, and delegation of authority to sign. The review shall not take longer than the 30-day period provided for in the law. If the agreement requires rework, only the reworked sections will be re-reviewed upon resubmittal. The review will look at three areas of potential concern; compliance with the law, compliance with Navy policy, and appropriateness of business interactions. Only legal and/or policy concerns will be grounds for nonapproval; the business aspect concerns will be furnished back to the originating organization for whatever treatment it believes is appropriate. It should be emphasized that the Navy is trying to provide as much latitude as possible in the development of the CRDAs. The principal headquarters concerns are compliance with the law and Navy policy and that the Navy is adequately protected from a liability standpoint.

In passing, I'd like to mention that we believe that the technology transfer program will have at least one beneficial tangential aspect. It should assist the Navy in recruiting and retaining the innovative technical people that it needs to make its R&D programs successful. The sharing of royalties is not usually a privilege of industry employees.

CURRENT STATUS

The DON Domestic Technology Transfer program is alive and well. The operation of the Navy system is in the hands of the individual Laboratory's Office of Research and Technology Applications (ORTA), the DON patent attorneys and the Office of the Chief of Naval Research (OCNR). Virtually all of the major Navy R&D laboratories have had technology transfer activities since at least the early 1970's. These activities have been consolidated and identified as the organization's ORTA. The ORTA duties include identification of candidate technologies for transfer and the marketing of the technologies to potential technology transfer partners. Assignment of ORTA responsibilities at the smaller activities has also taken place. The patent attorney organization and the OCNR policy team are fully functional. The Navy team is in place and operational.

The commercial rights to about 85% of the DON R&D (the contract R&D portion) are already spoken for. Standard practice is to give contractors the right of first refusal on the commercial intellectual property rights arising from our contract R&D program.

DON engineers and scientists are aware of the Domestic Technology Transfer Program and its implications and advantages. However, there is little evidence that technology transfer plays a major role in promotion decisions. Since the DOD/DON efforts are primarily directed at a military capability vice a civilian capability, this lack of Domestic Technology Transfer impact on the promotion process seems reasonable.

The Navy has, for a number of years, also had a program for the licensing of technology developed in-house. For example, the Navy has 33 royalty-bearing licenses currently in force. Of royalties paid, about $137,000 in 1990, almost one-third ($41,000) went directly to the inventors. There are also over one hundred non-exclusive non-royalty-bearing licenses in place. While these last provide no money to the Navy, they do transfer technology.

With regard to technology developed in our own laboratories, we are currently operating a decentralized sales force with central approval, and are, after the reorganization of our R&D assets, moving toward a partly decentralized approval system. The sales force is focusing on the work done in-house in DON laboratories; those technologies that we feel are mature enough and practical enough for commercialization are being pushed. We've worked hard to bring our work-in-progress data base up to date. We have ORTAs at all our R&D facilities, and an active infrastructure that meets several times a year. The Defense Technical Information Center (DTIC) serves as our reference library, and is available to contractors either through their government contract connections or through the Navy potential contractor program. The Navy FACT Sheet, with its 8,000-copy distribution list, also identifies salable technology to the public. Our Licensing program remains in place, but has shifted in recent years to granting significantly more exclusive licenses. Patent applications and patents are at a five-year high. We have 33 ongoing CRDAs with several more in preparation. Just recently we completed our first CRDA, with the Naval Research Laboratory concluding a series of tests designed to determine the effect of strong electromagnetic fields on the lifetime and failure modes of electric power transmission line insulation. The more than 30 CRDAs currently in operation include such diverse subjects as submicron electronic circuit lithography, a new biology-based method to determine toxicity of oil drilling wastes, and simulation techniques for training. An insistence against a fill-in-the-blank CRDA form has contributed great flexibility to the DON program. The CRDA concept is being used to do such things as develop instructional materials and software, develop methods of repair of composite materials, and determine the g-loading capability of humans. It should be noted that these 33 were negotiated regarding the work at 16 different Navy laboratories and centers. While the process is still young and growing, there is every sign that its future is bright.

PROBLEMS

On behalf of the Navy Technology Transfer community, I would like to thank the Congress for the recent statutory modifications in the technology transfer laws. The five-year FOIA exemption, the provision allowing royalties for non-patent forms of intellectual property, and the annulling of the 0.5% spending requirement were all helpful and useful.

There are, however, still problems in search of solutions. The lack of government ability to copyright in-house developed software poses significant difficulties to what would otherwise be a very attractive product transfer. A truly effective way of matching the government-developed technology to commercial needs is still needed. Specific authority to allow brokers a percentage of license royalties would allow new enticements to brokers. The recent increase in patent and patent maintenance fees by the Patent Office has also caused difficulty; DOD/DON budgets are not covering these increases, with the result that our stock-in-trade (patents) are left unprotected and thus usually unlicensable. The last few years have also demonstrated that much of the transferable technology is not covered by patents, but rather comes under the category of "know-how"; some method must be developed to allow the transfer of this to industry if the country is to enjoy the full benefit of the output of its federal laboratories. We also need specific authority to pass title of various equipments to industry as a part of the technology transfer process. Another item of concern in our laboratories is "fairness"; how broadly must an individual laboratory canvass for potential partners before licensing its output is of great concern to the laboratory directors responsible for signing CRDAs. Another item meriting study is some mechanism for incentivizing industry to buy our technology; all our efforts to sell are for naught if we don't have an eager customer. Solutions to these problems would be of significant assistance in making the DON technology transfer program more effective.

SUMMARY

In summary, the DON views the domestic technology transfer as having the following benefits and characteristics:

- It allows an avenue to reward our creative engineers and scientists, and aids in our ability to recruit such talent.
- It provides a way for DON-developed technology to quickly enter the commercial market place.
- It provides a vehicle for allowing private industry to use unique government facilities.

The continued evolution of the nascent DON domestic technology transfer program is expected to provide significant advantages to the DON for the foreseeable future.

Mr. THORNTON. Your testimony is exactly the kind of testimony that we have been hoping to receive—suggestions of problems that need to be addressed, suggestions of ways that you have moved to try and address some of those problems.

One thing that I was struck by was the diversity of inventions, the diversity of research, that come from the Navy, and a sense each CRADA has to be negotiated separately and it covers such a wide span of different activities, different sciences. Do you have the staff, do you have the legal expertise, to handle all of these different negotiations?

Dr. CULPEPPER. We don't handle the negotiations. The negotiations are done at the individual laboratories. Each of our laboratories has access to legal staff. What we do is review them at the home office after they have been—and then make sure that they have complied with what we view the current policy and the current law on the subject as being.

Mr. THORNTON. I am pleased to hear that. You delegate the responsibility for——

Dr. CULPEPPER. For the negotiations.

Mr. THORNTON. The negotiation.

Dr. CULPEPPER. And we are in the process of delegating the responsibilities to those laboratories that have demonstrated their ability to sign these things. We haven't finished doing that yet.

Mr. THORNTON. And one of the things that you are concerned about, in referring to the body contact, is that it is difficult to develop an incentive for the flow of this information, especially where it is not protected by patents.

Dr. CULPEPPER. Well, it is difficult in any event, but especially where it is not protected by patents.

I am an engineer by background and by training and by inclination, and it bothers me to have to make 100 contacts to make one sale. That is probably why I am an engineer and not a salesman. Until I can develop some sort of a system that would allow me to make that sale with only 10 contacts or five contacts, then I feel very uncomfortable with the inefficiency that I find inherent in that system.

Mr. THORNTON. I am reminded of the dangers of overeducation. A friend of mine said that each night he made a list of 20 people that he was going to call on the next day in order to make a sale, and he did a little experimentation. One day he would call all 20, and the next day he would go through the list and decide which ones were not likely to be purchasers and eliminate them from the list and then only call the five or six remaining on the list after he eliminated the other people, and I leave it to you to decide on which days he made the better sales record.

Dr. CULPEPPER. I would be curious as to his experience. As I say, I was a rotten salesman when I tried to sell newspapers door to door.

Mr. THORNTON. Well, his experience was that he did far better in going ahead and calling the entire list than to use his education to determine which ones would not be interested.

Dr. CULPEPPER. We need some way to make the process work a little cleaner than contacting the large majority, at least in my opinion.

Mr. THORNTON. Absolutely. There needs to be a selection process, and at the start of this example was a selection process, that he made a list——

Dr. CULPEPPER. Of 20, yes.

Mr. THORNTON [continuing]. Of 20 that might be likely to become purchasers.

Dr. Tallent, one thing that concerns me, having given you an accolade for the splendid example of the Cooperative Extension Service and its hands-on method of disseminating information, the report that we had at the start of the hearing today indicated that you have not developed ORTA's at the individual laboratories. Is that correct?

Dr. TALLENT. I think we have a little of the semantic problem that Mr. Adler referred to. We have what we call the Office of Cooperative Interactions, which I head, and we have six staff people in that who are ORTA's. One of those is in the field; we are about to add another one in the field; the rest are at headquarters.

Incidentally, we only have one lab in the Department of Agriculture that has the legislative requirement to have an ORTA, and that is Beltsville. Our next biggest labs will have on the order of 150 scientists. So what we have done is put a cluster of ORTA's, and they move around and serve these other labs.

Mr. THORNTON. If any of those labs are especially productive, you might do a daring step and put an ORTA in even though it is not required.

Dr. TALLENT. We are going to move in that direction. We have one in the field at Ames, Iowa, and we are looking—about to put another one in the field.

Mr. THORNTON. Dr. Culpepper, I was very impressed with the level of success that you outline, even though you are dealing with properties where you may have requirement for confidentiality or secrecy, and I assume that someone at your level makes the decision there as to what can be released.

Dr. CULPEPPER. Yes, that is correct. We are careful that we don't turn anything loose that would damage the Navy.

Mr. THORNTON. Are you particularly conscious of the problems that I outlined to other witnesses, developing CRADA's with non-United States-based companies?

Dr. CULPEPPER. That has never come up yet in the CRADA's that we have under development, but each of the CRADA's that we are signing out have a clause in there that suggests that if, in fact, they are taken over by a foreign company or something like that, that all the intellectual property rights revert to us.

Mr. THORNTON. Dr. Tallent, do you have any experience on that question?

Dr. TALLENT. Yes.

Incidentally, a technical point. I believe the law says that we give preference to companies in the United States.

Mr. THORNTON. That is correct.

Dr. TALLENT. A lot of the companies we deal with in the agricultural community are multinational—CIBA-Geigy, Hoffmann-LaRoche, Rhone-Poulene—who now owns what used to be Carbide and Carbon.

If we—before we go to a company that is totally foreign as opposed to a multinational with a big presence in the United States, we make absolutely sure there is not a U.S. company that is interested, and we go to extra lengths to assure that.

We do have a few CRADA's—one with a Japanese company and one with an English company—but in those, any license they get to an invention coming out of that CRADA will have to be—if the product is sold in the United States, the patent will have to be practiced in the United States. That is part of the patent law regulations.

Mr. **Thornton**. I heard both of you referring again to the question of, how do we protect proprietary information developed first of all—make software inventions a proprietary and protectable property right, calling it a copyright if need be? because, as I understand it, your testimony is that when you have something that can protect a producer for a period of time, it is more likely to move into the marketplace. Do you both agree with the need for copyright protection?

Dr. **Culpepper**. I certainly do.

Dr. **Tallent**. I also. I do.

Mr. **Thornton**. I am concerned whether that protection ought to be limited to CRADA opportunities or whether it should extend also to the results of other inventions that are not a military secret but other inventions which have potential for use even if they do not flow out of a CRADA. What do you think about that?

Dr. **Culpepper**. I would like to have it cover all software that is developed in the Government laboratories.

Mr. **Thornton**. Dr. Tallent?

Dr. **Tallent**. I agree.

Mr. **Thornton**. Do either of you have anything that you would like to add in way of summary to your testimony?

Dr. **Culpepper**. No, thank you.

Mr. **Thornton**. I want to thank you for your fine testimony and response to questions. Other members of the committee may desire to address questions in writing, and I would ask that you please respond to such questions as may be asked.

Dr. **Culpepper**. Most certainly.

Mr. **Thornton**. Thank you.

The hearing is adjourned.

[Whereupon, at 12:36 p.m., the subcommittee was adjourned.]

APPENDIXES

MAPI *Manufacturers' Alliance for Productivity and Innovation, Inc.*
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June 6, 1991

The Honorable Tim Valentine
Chairman
Subcommittee on Technology and Competitiveness
Committee on Space, Science, and Technology
House of Representatives
B-374 RHOB
Washington, DC 20515-6306

Dear Mr. Chairman:

Manufacturers' Alliance for Productivity and Innovation (MAPI) is pleased to submit written testimony for the hearing on technology transfer from federal labs which was held by the Technology and Competitiveness Subcommittee of the House Science, Space and Technology Committee on May 30, 1991.

In order to foster public awareness of the issues involving technology transfer from federal labs, MAPI requests that our statement be included in the official hearing record.

Thank you for the opportunity to make our view known and we hope the Subcommittee will act on our recommendations.

Cordially,

Ken McLennan
President

Enclosure

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Statement of the
Manufacturers' Alliance for Productivity and Innovation (MAPI)
to the
Subcommittee on Technology and Competitiveness
House Committee on Science, Space and Technology
Concerning
Technology Transfer From Federal Labs

May 30, 1991

We are pleased to submit this statement in support of enhancing the technology transfer process from federal labs to the private sector. MAPI believes that improved technology transfer from taxpayer-supported research laboratories will benefit many of our member companies and, for that matter, the country as a whole.

MAPI is a nonprofit policy research organization which, for over 55 years, has published studies and conducted seminars designed to encourage technological progress throughout the U.S. economy. The 500 companies affiliated with MAPI are heavily represented in the following industrial sectors: aerospace; automotive; electronics, computers, and telecommunications equipment; chemicals; oil and oil-related equipment; heavy industrial machinery; farm and construction machinery; and primary and fabricated metals.

Rather than deal with broad generalities about all federal laboratories, our statement will concentrate on the problems MAPI has found in the Department of Defense (DOD) research labs. In addition, MAPI offers specific recommendations for restructuring DOD laboratories and improving their technology transfer mission.

The State of Technology Transfer:
A Large Research Budget With
Meager Nonmilitary Returns

Public investment in military research and development (R&D) represents over 60 percent of total federal government funding for research and development and accounts for over one-quarter of all R&D funding in the United States from both public and private sources. Of the $38 billion spent last year by the Department of Defense on R&D, about $10 billion went to fund projects in the 68 in-house DOD laboratories.

From the huge sums spent on military-related technology, it is not too surprising to learn that the military services are an incredibly rich source of technology. The Navy is the ninth largest holder of patents in the United States, having 8,525 active patents as of June 1990. The Army is the twenty-first largest patent holder, while the Air Force ranks forty-eighth. In total, the three military branches hold 17,632 patents, making the U.S. military the second largest patent holder in America. Only General Electric Company, with 18,192 patents, has more than the Department of Defense./1

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1. All Technologies Report: January 1963-June 1990, A Technology Assessment and Forecast Report of the U.S. Patent and Trademark Office, September 1990.

Despite the billions of dollars that are spent for new technologies and the military services' history of research and development, only a minute amount of technology is transferred from the military laboratories to the private, nondefense sector. Traditionally, DOD laboratories transfer technology through research reports and publications in scientific journals. While this method might increase the prestige of the scientist among his peers, it generally does little to transfer technologies to the private sector. There is neither the personal contact needed to communicate technical issues nor the patent protection that is necessary to protect business investment in developing a new technology.

Only in the last several years have the services made a real attempt at licensing technology. The data show that royalties and other income from licensing amounted to only $7,000 in FY 1987 from the Army and Navy; in FY 1990 the combined income was $155,000. While the rising trend is going in the right direction, this is a meager return on the $38 billion invested in military R&D.

Another important measure of DOD's technology transfer effort is the growth in the number of Cooperative Research and Development Agreements (CRADAs). Many experts feel these agreements represent the most effective approach to technology transfer because the private sector is willing to invest two valuable commodities in the transfer process; money and staff time. Again, the military services' record in cooperative agreements suggests that the technology transfer process is only beginning. The Army and Navy combined entered into just two CRADAs in FY 1987 and only 76 in FY 1990.

MAPI Recommends Changes in Identifying and Marketing Military Technology

A New Technology Marketing Program

It is evident from looking at the record of the military labs that an effective technology marketing program has not been found. The main deficiency in the federal technology marketing system is the absence of a proactive approach. Both the Offices of Research and Technology Application (ORTA) located at the large defense labs, and the Federal Laboratory Consortium (FLC), which promotes the transfer of technology from federal labs to the private sector and to state and local governments, are grossly underfunded and understaffed. The current system operates without any outreach program that would stimulate business to consider using government-developed technology. At the same time, the private sector has often underestimated the potential benefits of the output of government labs. New mechanisms are needed to promote the connection between the private sector's technology requirements and the type of research done and the technology available in the defense labs.

MAPI recommends that Congress request that the Secretary of Defense study ways to set up a more effective marketing program for defense laboratory technology. Some elements of an improved technology marketing program might include:

-- Contracting with marketing firms for technology brokers, similar to industrial firms' use of manufacturer's representatives. Defense labs could pay a finder's fee or assign the technology broker a share of the royalties for commercializing technology.

-- Enlarging the role of defense advisory bodies to include responsibility for promoting technology transfer. For example, the Defense Science Board should consider drawing more of its members from scientists in private industry who could provide practical advice on commercial applications of defense technology.

-- Strengthening the Federal Laboratory Consortium by extending participation in the FLC to state industrial extension services and universities. The defense labs could tap into the latter two groups' existing lines of communication with industry.

-- Involving trade associations in the networking and feedback processes. Associations are a good source of information concerning specific areas of manufacturing and their members' technology needs. Trade associations also could serve as a conduit in educating their members as to what is available and how to draw out the technology from federal research.

Technology Marketing Reforms

Any breakthrough in technology transfer, however, has to involve a commitment by private industry to seek out and take advantage of the resources at the defense laboratories. A recent General Accounting Office (GAO) report found that about 45 percent of the guests and visiting researchers at 50 large federal labs were from foreign countries./2 The large number of foreigners participating in the labs' visiting scientist programs is not due to any numerical requirement, but results from the traditional view held in private industry that government labs have a poor track record of producing innovations. Firms must overcome their natural hesitancy to avail themselves of the government's resources and assign to their top scientific people the task of ferreting out the technology developed at defense laboratories which has potential commercial application. It is common knowledge that our foreign competitors are now much more successful than U.S. firms in adapting the results of U.S. federally funded research to commercial applications.

MAPI recommends the following actions be taken to support the technology marketing effort:

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2. Technology Transfer: U.S. and Foreign Participation in R&D at Federal Laboratories, Report of the General Accounting Office, GAO/RCED-88-203BR, August 1988, p. 2.

-- Develop a centralized database for new and emerging technology from defense laboratories. Such an information system would make it easier to identify what work each lab is doing and would simplify the initial phase of technology transfer.

-- Allow federal agencies to copyright computer software developed by federal employees. Federal ownership of this intellectual property would greatly increase its commercial value. It is just too risky for a software development company to invest in commercializing noncopyrighted software.

-- Institute a screening process so that defense agencies could identify important technology and act to protect its worldwide value for U.S. business. Defense laboratories do not normally file for foreign patents on technology they develop./3 However, once they publish their findings in the technical literature, in many cases the act of publication would prevent patenting abroad.

-- Replace military with industrial specifications whenever possible. DOD frequently fails to recognize that in many cases off-the-shelf commercial products are sufficient to meet military requirements. This "must be invented here" attitude on the part of the Defense Department should change so that the military is able to draw on the already large commercial base for technology.

DOD's Laboratory Structure Is a Barrier to Technology Transfer

A unique, and probably unfortunate, feature of the Department of Defense's laboratory system is that all the labs are government-owned and government-operated (GOGO). As government-operated facilities, labs are subject to onerous civil service rules and all the red tape that goes with any government bureaucracy. A recent workshop on the "Challenges Confronting the DOD Laboratories," attended by people from both inside and outside the DOD laboratory system, was charged by the House Armed Services Subcommittee on Research and Development to focus on six issues:/4

-- Many defense labs function without a clear sense of mission. They may have been formed decades ago to investigate technology that is obsolete or less important today.

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3. Some Remaining Issues Related to Federal Technology Transfer, Federal Laboratory Consortium for Technology Transfer, Washington, DC, November 1990, p. 2.

4. Challenges Confronting the DOD Laboratories, Report of the Research and Development Subcommittee, Committee on Armed Services, House of Representatives, February 22, 1990, p. 1.

- The federal pay schedules and personnel rules inhibit hiring and retaining top scientific and managerial talent.
- There are long delays in updating buildings and purchasing major pieces of research equipment.
- Funding is often unpredictable, fluctuates from year to year, and can stifle long-range planning activities.
- The labs operate under burdensome procurement regulations that often impede R&D activities within the labs.
- Laboratory managers do not have sufficient authority to make major decisions affecting their laboratory operations and the quality of their personnel.

The Carnegie Commission on Science, Technology, and Government recently released a report which criticized the DOD's laboratory structure. The Commission said that the 68 Department of Defense labs are:

> . . . uneven in quality and poorly coordinated with one another, with the future technology needs of the DOD, and with the opportunities afforded by emerging technologies. Some are too small to have a critical mass of productive activity in any field; some were created to advance fields that are now obsolete; some are neglected by their service patrons. All suffer from unforgiving civil service personnel policies and bureaucratic red tape./5

Change DOD's Laboratory System

There are major problems with the DOD laboratory system that need to be addressed quickly and decisively. MAPI recommends the following actions:

- Restructure the labs and provide a clear and meaningful mission for each remaining laboratory.
- Convert as many DOD labs as possible to contractor operations, preferably using industrial firms and universities to operate the labs.
- Reduce the burdensome procurement regulations and other bureaucratic procedures that must be used by defense laboratories in obtaining scientific equipment and supplies.

Provide Incentives To Manage Technology

Other problems exit in the management of the defense laboratories. Technology transfer receives varying levels of commitment among lab directors.

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5. New Thinking and American Defense Technology, A Report of the Carnegie Commission on Science, Technology, and Government, August 1990, p. 20.

For many labs, technology transfer is a sideline--something to work around. In fact, much of DOD lab work is classified as "secret." In these circumstances, labs do not want to spread the technology. The danger is that the shroud of security could be abused and hide promising commercial technology. Another barrier to technology transfer is that federal government scientists are reluctant to work with private industry. Cooperating with the private sector takes time away from a federal scientist's research work and does not count in his performance appraisal./6

To address these issues, MAPI recommends the following administrative changes:

-- DOD should review its security criteria and make every effort to keep technology with commercial potential unclassified.

-- The congressional mandate for technology transfer should be reflected in each laboratory's mission statement and in the director's own job performance evaluation.

-- DOD should consider establishing a special bonus fund that would provide financial awards to federal laboratory personnel for outstanding contributions to the technology transfer process.

-- There should be legislation to require each laboratory and its parent agency to disclose on a timely basis certain technology transfer activities, such as the number of CRADAs, patents licensed, etc. This will enable legislators and the public to monitor the federal government's progress in the technology transfer area.

Technology transfer is a "win-win" situation for both the military and the private sector. Adoption of DOD-funded technology by the manufacturing sector strengthens the industrial base and supports the military's requirements for high-quality products from reliable suppliers. Ultimately, improved technology transfer from the defense laboratories to U.S. business will generate spinoffs that may eventually benefit us all.

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6. Making Things Better: Competing in Manufacturing, Report of the Office of Technology Assessment, Congress of the United States, February 1990, pp. 191-192.

FINAL DRAFT 4/4/91

Headquarters
Department of the Army
Washington, DC
(Date)

*** Army Regulation 70-57**

Effective (date)

Research, Development, and Acquisition

Military-Civilian Technology Transfer

Summary. This regulation implements 15 USC 3701 et seq., Executive Order 12591 and DOD 3200.12-R-4. It requires the establishment of organizational elements and prescribes Department of Army responsibilities and policies for active technology transfer to the domestic civilian sector. Specifically, it provides policies and operational guidelines for the provision of technical assistance to State and local governments, for the licensing of intellectual property, for entering into Cooperative Research and Development Agreements, and for other cooperative efforts in research and development necessary to provide new technologies of interest to the civilian sector as well as the military.

Applicability. This applies to all research and development centers, laboratories, activities, and appropriate staff elements of the Active Army.

Internal control systems. This regulation is subject to the requirements of AR 11-2. It contains internal control provisions but does not contain checklists for conducting internal control reviews.

These checklists are being developed and will be published at a later date.

Supplementation. Supplementation of this regulation and establishment of command and local forms are prohibited without prior approval from HQDA (SARD-ZT), WASH DC 20310-0103.

Interim changes. Interim changes to this regulation are not official unless they are authenticated by the Administrative Assistant to the Secretary of the Army. Users will destroy interim changes on their expiration dates unless sooner superseded or rescinded.

Suggested improvements. The proponent agency of this regulation is the Office of the Assistant Secretary of Army (Research, Development, and Acquisition). Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to HQDA (SARD-ZT), WASH, DC 20310-1000.

Distribution. Distribution of this publication is made in accordance with the requirements on DA Form 12-09-E, block number __________, intended for command levels C, D, and E for Active Army.

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* This regulation supersedes AR 70-57, 15 May 1983.

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Chapter 1
Introduction

Section I
General

1-1. Purpose

a. This regulation implements 15 USC 3701 et seq., Executive Order 12591 and DOD 3200.12-R-4 and prescribes Department of Army (DA) responsibilities and policies for active technology transfer to the domestic civilian sector, including technical assistance to State and local governments and cooperative technology development with private sector and civilian public sector organizations. This regulation specifically--

(1) Requires integration of technology transfer from the military to the civilian sector into the mission of the Army and of each specified laboratory and research and development (R&D) center,

(2) Requires the establishment and staffing of an organization within each of these specified laboratories or centers to perform the domestic technology transfer functions,

(3) Requires the establishment of the Army Domestic Technology Transfer Program (ADTTP) Manager, and

(4) Prescribes DA management policies and procedures to insure the effective use of Army resources in cooperative R&D, the provision of technical assistance and other domestic technology transfer activities.

b. This regulation addresses domestic technology transfer as an active effort to foster additional benefits of Army technology and technical expertise, developed for the primary military mission, by sharing this technology to fulfill needs in the U.S. domestic civilian economy. It is not directed toward technology transfer as the movement of technology either from one stage of development to the next, or from development to application in the primary military mission. Further, it is not directed toward international technology transfer or the unintentional passing of Army-developed technology to potential adversary recipients.

1-2. References

Required and related publications are listed in appendix A.

1-3. Explanation of abbreviations and terms

Abbreviations and special terms used in this regulation are explained in the glossary.

Section II
Responsibilities

1-4. The Assistant Secretary of Army (Research, Development and Acquisition) (ASA(RDA))

The ASA(RDA) is delegated all the authorities provided to the Head of the Agency by 15 USC 3701 et seq. and is responsible for establishing and ensuring the execution of policies for the Army Domestic Technology Transfer Program (ADTTP). The ASA(RDA) or the Deputy for Research and Technology acting for the ASA(RDA) will:

a. Establish policies and procedures for the ADTTP.

b. Specify Army laboratories and centers which conform to the definition of a laboratory in the the law and therefore, must establish an Office of Research and Technology Applications (ORTA), or equivalent organizational element, and specify those that require at least a full-time equivalent position to be responsible for performing the ORTA functions which will include any laboratory or center having 200 or more full-time equivalent professional scientific, engineering or related technical personnel.

c. Delegate the authority to enter into Cooperative Research and Development Agreements (CRDAs) and to license, assign or waive rights to intellectual property, to the Heads of the Technology Developing Agencies for redelegation to the Commanders or Directors of specified laboratories and centers.

d. Review, or have reviewed on their behalf, all signed CRDAs, except those developed under the Corps of Engineers Construction Productivity Advancement Research (CPAR) Program, and all Patent License Agreements (PLAs) within 30 days of submission for conformance to Army policy and interests.

e. Establish an archival file of all Army CRDAs and PLAs and assure maintenance of these records.

f. Cooperate with other Federal Agencies to maximize the effectiveness of Federal domestic technology transfer efforts and assure adequate Army representation on Interagency groups concerned with technology transfer.

g. Transfer to the National Institute of Standards and Technology (NIST) for use by the Federal Laboratory Consortium (FLC) on an annual basis an amount equal to eight thousandths of one percent (0.008%) of all Program 6 "Research and Development" resources as defined in the DOD Planning, Programming and Budget System that are allocated to the Army laboratories and centers, the intramural performers, as required by DOD 3200.12-R-4.

1-5. The Commanding General (CG), Army Materiel Command (AMC)

The CG, AMC or the Deputy Chief of Staff for Technology Planning and Management (DCSTPM) acting for the CG, AMC, will establish the position of the ADTTP Manager and provide organizational support, including appropriate legal and Resource Management functions, and program oversight on behalf of the ASA(RDA).

1-6. The Army Domestic Technology Transfer Program (ADTTP) Manager

The ADTTP Manager will perform the following on behalf of the ASA(RDA):

a. Monitor the ADTTP and levels of effort of all Army specified laboratories and centers.

b. Provide policy guidance on domestic technology transfer to the Technology Developing Agencies and their specified laboratories and centers and coordinate and support the activities of all Army ORTAs.

c. Serve as the Army Agency representative to the FLC, as the official Army liaison on domestic technology transfer with DOD and other Agencies, as the Army representative in the Executive Working Group of the Interagency Committee on Federal Laboratory Technology Transfer, and otherwise represent the Army in matters concerning domestic technology transfer as required.

d. Coordinate review of all signed Army CRDAs, except those developed under the Corps of Engineers CPAR Program, and all PLAs within 30 days of submission with advice from the Intellectual Property Counsel of the Army (JALS-PC) and provide review for conformance with Army policy and interests on behalf of the ASA(RDA) and, if necessary, disapprove or require modification to achieve conformance.

e. Receive copies of all Army CRDAs and PLAs upon execution and maintain an archival file of these on behalf of the ASA(RDA).

f. Administer the collection and distribution of royalties and other income from licensing under Army domestic technology transfer activities in accordance with this regulation, and AR 37-1 and its amendments.

g. Collect information as needed, and establish and maintain a data base to allow evaluation of program activity and effectiveness, and to provide routine and special reports.

1-7. The Intellectual Property Counsel of the Army (JALS-PC)

The JALS-PC is responsible for the legal review of all CRDAs and PLAs on behalf of the ASA(RDA) within the 30-day review period.

1-8. Commanders of Major Commands and other Heads of Technology Developing Agencies

The CG, AMC; The Surgeon General; The Chief of Engineers; the CG, Strategic Defense Command; the CG, Information Systems Command; and The Deputy Chief of Staff for Personnel will assure the execution within their organizations of the policies set forth in this regulation. These Commanders of Major Commands and other Heads of Technology Developing Agencies will delegate to the Directors and Commanders of their specified laboratories and centers--

a. The authority to enter into CRDAs and

b. To license, assign or waive rights to intellectual property developed by their organizations.

These Heads will exercise these authorities themselves, as needed, to execute a CRDA on behalf of several of their specified laboratories and centers or to license intellectual property created in their Command but not associated with a particular laboratory or center. The Chief of Engineers will assure that copies of all CPAR agreements which are not subject to review coordinated by the ADTTP Manager are sent to the ADTTP Manager for record keeping as required by the law. All Heads of Technology Developing Agencies will designate a point of contact for domestic technology transfer at their Headquarters. Designees will provide a chain of communications, monitor and support program performance in their Command, support the ADTTP Manager in coordinating the programs of R&D activities under their Command, and ensure execution of stated Army policies.

1-9. Commanders or Directors of specified laboratories and centers

Each Director or Commander of an Army laboratory; Research, Development and Engineering Center; or other R&D activity specified as a laboratory or center for domestic ~~technology~~ transfer by the ASA(RDA) is responsible for accomplishing active technology transfer to the civilian sector from his respective laboratory or center, including providing technical assistance to State and local governments and cooperating in technology development with private sector and civilian public sector organizations. The Directors and Commanders of all specified laboratories and centers are delegated the authority to enter into CRDAs and to license, assign or waive rights to intellectual property created in their organizations and are responsible for carrying out the policies specified by law and DOD 3200.12-R-4, as set forth in this regulation. Specifically, the Director or Commander of each specified laboratory or center identified by the ASA(RDA) will--

a. Establish a staff-level ORTA, or equivalent identifiable organizational element, adequately staffed and funded to execute the policies and perform the functions required by law as specified in this regulation.

b. Specify a professional individual to be responsible for managing the domestic technology transfer activities of the laboratory or center, and for accomplishing the functions of the ORTA specified in this regulation.

c. Assure that at least one full-time equivalent position be devoted to the performance of the ORTA functions if the specified laboratory or center has 200 or more full-time equivalent professional scientific, engineering, and related technical personnel.

d. Include goals for, and objectives of, technology transfer in the performance standards of the senior technical managers of the activity and assure that transfer efforts are considered positively in job descriptions, promotion policies, and evaluations of the job performance of scientists and engineers.

e. Encourage the establishment of a Technical Volunteer Service (TVS) and participation by technical staff in the volunteer program to support technical assistance to State and local governments and local educational organizations.

f. Make available adequate funds for support of the ORTA activities, for services of partnership intermediaries, and for in-kind contributions to CRDAs equal to not less than one-half of one percent (0.5%) of the funds obligated internally for R&D by the laboratory or center.

1-10. The Head of the Office of Research and Technology Applications (ORTA)

The Head of each ORTA or equivalent organization in each specified laboratory or center is responsible for managing the domestic technology transfer activities of the laboratory or center including establishing cooperative R&D, licensing intellectual property and providing technical assistance. The Head of the ORTA will--

a. Prepare an application assessment of selected R&D projects that have potential commercial applications.

b. Provide and disseminate information on Federally-owned or originated products, processes, and services having potential application to State and local governments and to private industry.

c. Cooperate with and assist the Federal Laboratory Consortium (FLC), the National Technical Information Service, and other organizations that link the R&D resources of that activity, and the Federal Government as a whole, to potential users in State and local government and United States private industry.

d. Provide technical assistance to State and local government.

e. Participate in regional, State, and local programs designed to facilitate or stimulate the transfer of technology for the benefit of the region, State or local jurisdiction in which the activity is located.

f. Provide laboratory representation and support to the FLC.

g. Participate in appropriate activities of the public and private sector that provide the opportunities to achieve technology transfer objectives and support them commensurate with other participants; e.g., local government meetings, small business conferences, and local economic development organizations.

h. Assist program managers and technical Department Heads in identifying technologies suitable for transfer and for which application assessments need to be developed.

i. Identify, with the patent counsel supporting the activity, patents and patent applications for which notification of availability for exclusive licensing is required by law and publicize such availability.

j. Coordinate domestic technology transfer activities with patent counsel to determine rights to technical data, patent and licensing implications, and the commercial potential of patentable technology.

k. Ensure that no domestic technology transfer activities substantially compete with services available in the private sector.

l. Ensure that no domestic technology transfer activities conflict with export control regulations, policies governing militarily critical technology, or any of the responsibilities and procedures for technology transfer control in DOD directives, instructions, and publications.

Chapter 2
Domestic Technology Transfer Policy

2-1. Active domestic technology transfer

It is the Department of the Army (DA) policy to strongly support domestic technology transfer as an integral part of the R&D effort and to require active technology transfer from all appropriate R&D activities, consistent with the military mission. The Commanders or Directors of specified Army laboratories and R&D centers have the responsibility and the authority to enter into Cooperative Research and Development Agreements (CRDAs) with both public and private sector organizations; to license, assign or waive rights to intellectual property developed by their activity; and to support active marketing and assistance by their laboratories or centers, including participation in economic development organizations, contracting with partnership intermediaries and the provision of technical assistance to State and local governments and local educational systems.

2-2. Funding at specified laboratories and centers

Adequate funding shall be made available to execute plans for active transfer by Army and its specified laboratories and centers. At each specified laboratory or center, funding equal to not less than one-half of one percent (0.5%) of the funds obligated internally for R&D is provided as guidance for overhead expenditures for the Office of Research and Technology Applications (ORTA), for services of partnership intermediaries and for the cost of efforts contributed to cooperative R&D.

2-3. ORTA staffing

Specified laboratories and centers of the Army shall establish an ORTA, or equivalent organizational element, adequately staffed to plan and executive a domestic technology transfer program on behalf of the Commander or Director to include, but not be limited to:

a. The assessment and marketing of potentially transferable technology,

b. The establishment, negotiation, and management of cooperative R&D under CRDAs,

c. The negotiation of licenses for intellectual property developed by the activity,

d. The representation of the activity in Regional, State, and local economic development organizations,

e. The participation of the activity in the Federal Laboratory Consortium (FLC), and

f. The arrangement of technical assistance to local governments and school systems.

2-4. ORTA staffing related to technical staff size

Specified laboratories and centers with 200 or more full-time technical staff shall provide at least one full-time equivalent to staff the ORTA. It is Army guidance that at least one individual professional be assigned full-time to the ORTA unless there are unusual circumstances such as multiple geographic locations of the technical staff which must be supported. ORTA staffing in activities with less than 200 full-time technical staff shall be adequate to accomplish the transfer of mission technology. In activities with less than 200 full-time equivalents of technical staff, the level of effort devoted to the ORTA is expected to be at least proportional to the number of technical staff.

2-5. Professional performance and awards

Domestic technology transfer and the dissemination of scientific and technological information, consistent with mission responsibilities, is a responsibility of each laboratory and R&D center science and engineering professional. Furthermore, each laboratory and R&D center Commander or Director shall ensure that accomplishments in domestic technology transfer are included in the performance standards of senior technical managers and are considered positively in laboratory job descriptions, employee promotion policies, and evaluation of the job performance of scientists and engineers. Further, it is Army policy to provide incentive awards to employees in accordance with AR 672-20 for domestic technology transfer accomplishments.

2-6. Cooperative R&D Agreements

R&D efforts under CRDAs shall be consistent with the missions of the laboratory, but it is not required that the activity receive direct benefit from the effort other than the transfer of its technology to the marketplace. Special consideration shall be given to entering into CRDAs with small business firms and consortia involving small business firms, as well as to businesses located in the United States or those which agree that products embodying inventions made under the CRDA or produced through the use of such inventions will be manufactured substantially in the United States. Commanders or Directors shall apply principles of fairness and sound judgment in the selection of parties with whom to enter into CRDAs. Competitive procedures normally associated with awards of procurement contracts need not be applied to CRDAs.

2-7. Cooperation with SBIR Program

It is Army policy for the ADTTP to cooperate with the Small Business Innovation Research (SBIR) Program, to perform outreach jointly with SBIR outreach, and to offer technical assistance and opportunities for CRDAs to the technology oriented small businesses in the SBIR constituency. In particular, companies in SBIR should be provided technical information from the laboratory network to help them succeed and companies at the end of Phase II of the SBIR Program should be provided the opportunity to enter into a CRDA with the appropriate Army activity to support the commercialization of the company's technology and transition into Phase III, as well as allowing the commercialization of related technology from the Army activity.

2-8. Transfer to foreign companies

The execution of CRDAs or PLAs with foreign-owned companies is not precluded, but when entering into CRDAs with foreign entities, the activity Commander or Director shall, in consultation with the Office of the United States Trade Representative if needed, consider whether such entities permit and encourage U.S. participation on a comparable basis, whether those foreign governments have policies which protect U.S. intellectual property rights, and whether those foreign governments have adopted adequate measures to prevent the transfer of strategic technology to destinations prohibited under National security export controls through the Coordinating Committee for Multilateral Export Controls (COCOM) or through other international agreements to which the United States is a signatory.

2-9. Distribution of royalties and other income

CRDAs and PLAs will include instructions for the payment of royalties and other payments to the Army in accordance with AR 37-1 and its amendments. Distribution of royalties and other incomes from licensing received by the Army from these agreements shall be managed by the ADTTP Manager. If income received by the Army is less than one thousand (1,000) dollars times the number of inventors, the eligible Army inventor(s) shall receive the entire amount of income in equal shares. If the income is greater than one thousand (1,000) dollars times the number of Army inventors, the eligible inventor(s) shall share equally twenty percent (20%) of the total income or one thousand (1,000) dollars each whichever is greater. Each calendar year, payments up to one hundred thousand (100,000) dollars may be made to each of the creators of Army intellectual property in accordance with the law, DOD 3200.12-R-4, and AR 37-1. The residual funds (if any) will be distributed in accordance with AR 37-1, such that the majority will be sent to the activity where the intellectual property was developed and the remaining percentage of the residual money will be distributed at the discretion of the ADTTP Manager to any Army R&D activity making a request for funding for authorized purposes which will strengthen its program. Any laboratory or center receiving any portion of royalties or other income from technology transfer activities is constrained to use these funds during the fiscal year in which the funds are received by the laboratory or the following fiscal year for the purposes specified in this regulation, in accordance with 15 USC 3710c(a)(1)(B).

2-10. Technical Volunteer Service (TVS)

It is Army policy to encourage and cooperate with the establishment of a Technical Volunteer Service (TVS) at each specified laboratory and center, or at a group of co-located activities, as a resource to complement and support technical assistance to State and local governments and local educational systems. When needed, actual volunteer activities may be accomplished in duty-hours with management and volunteer agreement that there will be no adverse effect on the quality or timeliness of mission work.

2-11. Participation in the Federal Laboratory Consortium (FLC)

It is DA policy for the Agency and its specified laboratories and centers to support and participate in the FLC. In addition to the

Agency providing annually an amount equal to eight thousandth of one percent (0.008%) of the R&D laboratory budget, as defined in DOD 3200.12-R-4, to the National Institute of Standards and Technology for use by the FLC, and formal membership in FLC in accordance with 15 USC 3710 (e)(2), representatives of the Agency and its laboratories and centers will actively participate in, and contribute reasonable effort to, the management of FLC, its committee and task force activities, its networking for referral, and its National and regional outreach activities and meetings. The marketing of laboratory technology and other program outreach is enhanced by having the Army laboratories and centers function as a sub-network of the FLC.

2-12. No competition with private enterprise

In the execution of the ADTTP, appropriate care will be taken to avoid actions which might create the appearance of undue influence over, or competition with, private enterprise and the free operation of the economy.

2-13. Conformance with security and other regulations

Managers at all levels will ensure that actions taken under the ADTTP do not conflict with export control regulations, policies governing militarily critical technology, policy requirements for recouping DOD non-recurring costs, or any of the responsibilities and procedures for technology transfer control in DOD Directives, instructions, and publications.

Chapter 3
Principles for Program Management

Section I
Principles for ORTA Operations

3-1. General

It is the intent of National policy on technology transfer from Federal laboratories to increase both the speed and the extent of applications in the domestic economy of the technological resources of Federal laboratories and R&D centers. Thus, greater payback for the investment in Army R&D is sought through more rapid and diverse spin-off of Army-developed technology for new and improved products and processes which will allow U.S. industry to achieve a better competitive position. Greater payback is also sought through the use of Army expertise to improve the cost-effectiveness of services provided to the public by State and local governments. Another aspect of technical cooperation and help for State and local governments which can significantly impact U.S. competitiveness is working with non-Federal programs to help expanding small businesses and helping to improve education in science and technology, thereby providing for a better prepared future workforce. The legislation and executive order which are the major expression of this policy recognize that the transfer of technology and the effective sharing of scientific and technological expertise for economically valuable application require flexible person-to-person cooperative relations at the working level in both the transferring and the receiving organization. Because of this recognition, the law requires an approach which is decentralized to the laboratories and centers, and which establishes a "marketing department" called the Office of Research and Technology Applications (ORTA) at each activity. Further, laboratories and centers must be responsive to non-Federal public sector and private sector clients who seek Federally-developed technology. The ORTA at each activity, as with any high tech marketing department, must not only make potential clients aware of their technology, but of the value to the client of adopting the technology. Further, in order to accomplish technology transfer or provide effective technical assistance services, the ORTA must understand and appreciate issues related to commercial markets, as well as organizational resistance to change which often surface during the adoption of technological innovations.

3-2. Technology applications assessment

The assessment of laboratory or center technology is a process involving the continual interaction of ORTA staff with the scientists and engineers in the activity as well as the review of patent applications, and other documents presenting mission project progress and results. This continuing process will result in a knowledge base which the ORTA can use to respond to inquiries and unanticipated application opportunities defined by potential clients. The process will also provide the knowledge used to generate the "application assessment" documents noted in the legislation. These application assessments are a summary of laboratory or center technologies which show potential civilian or dual-use applications, or range of applications. Such summaries, or adaptations of them, should be submitted to the National Technical Information Service, and otherwise widely disseminated, as a part of the marketing effort. Formal assessment documents should be prepared for technology meeting either of two criteria: First, the technology is representative of the capabilities of the activity and may be used to illustrate these capabilities meaningfully to potential civilian collaborators or potential clients for technical assistance; or second, the technology is judged to have a clear, economically significant, civilian application for which it can be marketed.

3-3. ORTA marketing strategies

a. For the ORTA, there are two types of marketing efforts to pursue. The first of these is principally marketing the service of technology transfer. Although marketing the service will primarily result in technical assistance efforts and frequently referral to other laboratories, it raises the awareness of potential users that Federal activities have valuable technology which is available, and causes clients to seek technological solutions to existing problems in the commercial world. This creates what is called a "technology pull" which draws technology from the laboratory to an application which is largely defined by the client. If an inquiry matches the capability of the laboratory or center, the transfer of its technology may take place. If the inquiry is outside the technical area of the particular laboratory or center, an efficient referral to other Army activities, or to other laboratories through the FLC, will enhance the reputation of the activity and increase its visibility in marketing its own technology.

b. The second type of marketing effort for the ORTA is to obtain adoption of a specific technology, known as "technology push". The ORTA, and others familiar with the technology, may realize the commercial or public importance of a technology but must find an appropriate collaborator or adopter for its application. In this case, the ORTA, and probably the technology developer within the laboratory or center, must seek to understand the application environment and develop an approach which has credibility with potential users. If the "tech briefs" and other material are crafted for the potential users, distribution of this material, and announcements in trade publications as well as presentations at trade shows, technical symposia, technology transfer conferences, and trade association meetings may attract interested collaborators and licensees. Various data bases may also be used to identify and target organizations which might adopt the technology.

3-4. Technical assistance and organizational outreach

a. Technical assistance services, including help by technical volunteers, must be marketed to State and local governments and school systems to make the officials in these organizations aware of the service and how it can help them. There are a number of ways in which Army laboratories and centers may provide direct technical assistance to non-Federal government agencies, especially local governments. These include problem analysis, providing and interpreting technical information, "hands-on" technical help from laboratory volunteers, and limited projects in the laboratory or center on a problem when this does not compete with available private sector services.

b. In a number of cases, help by the laboratory to demonstrate the value of a technology followed by help in transitioning to support by a private contractor provides the basis for new or expanded commercial activity. As examples, areas in which direct technical assistance might be provided include, but are certainly not limited to, police communications, corrosion prevention, computerization, environmental assessment and pollution control, and training in logistics and maintenance. In regard to school systems, assistance can be help for the system operation, as with computer networking or advice on bus maintenance, or it can be help to teachers and students to improve science and technology education. Another kind of assistance to State and local governments is to help them help the businesses in their area. This is based on the concerns of State governments, and many local governments, for economic development in their jurisdiction. These governments are sponsoring or convening organizations to help start new businesses and expand existing business. Laboratories and centers may pay for services from State and local government related organizations, meeting the definition of a partnership intermediary, to help with transfer to small businesses. Further, the ORTAs can help evaluate technical aspects of new business proposals for governments and can serve as a technical resource to help businesses selected by State and local programs as being of value to the local economy. Visibility, credibility and understanding of the value of the laboratory or center and its technology are enhanced by this participation and positive interaction with the local community. Outreach to regional, State and local organizations should be planned and carefully maintained because the benefits are long-term. Also, such interactions must be pursued with sensitivity to local issues and possible conflicts between various local organizations.

3-5. Training and rewarding laboratory staff

Although technology transfer and the provision of technical assistance are planned and organized by the ORTA, the laws and Army policy make them the responsibility of every technical staff member and their active participation is essential to an effective program. The technical staff is the front line in the assessment process, and the experts in adapting the technology for commercial application and providing technical assistance. They are the volunteers. It is thus essential that they be carefully informed by the ORTA about the new mandate and authorities, and trained in their responsibilities. The requirements for cooperation with the private sector and providing help to non-Federal agencies represent a change in the culture in most Army R&D activities. There is the possibility of royalties for licensed intellectual property and technical staff people must understand that action leading to possible transfers are encouraged and rewarded by their organization. At a minimum, transfer objectives should be included in the performance standards of technical managers of major technology producing programs and incentive awards should be provided under AR 672-20 for accomplishments in domestic technology transfer and technical assistance.

Section II
Participation in the Federal Laboratory Consortium

3-6. Federal Laboratory Consortium background

The Federal Laboratory Consortium (FLC) for Technology Transfer began as an informal association of DOD laboratories in 1971, was expanded to include all Federal laboratories in 1974, and was finally chartered by Congress as a part of the 1986 legislation. The Consortium members are the Federal laboratories and centers. Army has been a strong participant since the beginning, and active participation in FLC by Army laboratories and centers has been required by regulation since 1983. As a convener of those from all sectors concerned with Federal laboratory technology transfer, the FLC has been a significant force in achieving consensus on the value of the effort and the most effective approaches.

3-7. Federal Laboratory Consortium purposes

The Consortium has three principal purposes which are:

a. Providing a forum for the development of consensus, and for the exchange of ideas, on the best approaches to technology transfer.

b. Performing a National outreach on behalf of all Federal laboratories and increasing the awareness of the potential value of Federal laboratory technology.

c. Providing a National referral network to allow potential users to gain access to any Federal technology, by contacting any activity of which they become aware.

3-8. Federal Laboratory Consortium activities

The FLC has funds for special demonstration projects and for some administrative support. However, the development of general outreach, the organization of interactions with various constituent groups, the development of training of broad interest and, in particular, the functioning of the referral network depend upon the contributed efforts of the representatives. It is Army policy for Army laboratories and centers to function collectively as a sub-network of the FLC. This provides a service to potential clients which can enhance the image of the Army among many important constituents. By providing efficient referral if the contacted activity does not have the technology, Army activities become the first choice to call for assistance, and thus, have the first opportunity to transfer their technology. Beyond this, participation in FLC meetings and working groups at both the regional and National level provide unparalleled opportunities for Army representatives to interact with important representatives of client groups which provide marketing contacts and with innovators in the transfer process who can provide insight for improving Army transfer efforts.

Section III
Establishing Cooperative R&D Agreements

3-9. The value of cooperative efforts

The establishment of cooperative R&D efforts has the greatest possibility of long-term payoff of any transfer mechanism since the intimate working relationship will allow Federal scientists and engineers to understand the commercial needs and also allow a reverse flow of ideas into the laboratory mission effort. The ORTA's effort to establish CRDAs must, of course, be prioritized and should emphasize two main characteristics. First, CRDAs should be established to develop technology with an obvious value either in commercial application for U.S. competitive position or in application for the public good as in health or pollution control. Second, CRDAs should be sought in technology areas of strategic importance to the laboratory or center.

These CRDAs should be sought with innovative and entrepreneurial organizations which can succeed in taking Federal technology to a competitive market and which have a great potential to inspire innovation in the mission work.

3-10. Resources for cooperative efforts

Resources for Army contributions to CRDA efforts should be guided by the expectation that at least 0.5% of the R&D budget of the activity should be expended on domestic technology transfer. This cost is a reasonable guidance for the sum of the ORTA funding plus in-kind contributions to the execution of CRDAs. Any funds paid to an Army laboratory under the terms of a CRDA (other than those paid for patent licenses) for special services, such as use of highly specialized equipment, utility costs, labor, etc., shall be made directly to that laboratory.

3-11. Technology transfer through intellectual property rights

As with any R&D effort, a cooperative research and development project is likely to create intellectual property such as patents, copyrights and technical data. It is important for the parties to the agreement to have a clear understanding as to how those intellectual property rights will be allocated. The allocation of intellectual property rights should be structured so as to achieve the goal of transferring technology from the Army laboratory to the private sector. That goal is most likely to be achieved when intellectual property rights are placed in the hands of the private sector and when the private sector is given some measure of exclusivity for a reasonable period of time and for specified fields of use or market segments.

3-12. Licensing background patents

In the case of patents, it is necessary to consider background patents as well as patents which might arise out of the cooperative effort. Background patents are those which pre-exist the cooperative effort. If they dominate the technology being developed, background patents owned by the Government should be licensed, possibly on an exclusive basis, to the collaborator. The procedures defined in Section IV for licensing of Army-owned patents, including the public notice requirements, must be followed if background patents are to be licensed on an exclusive basis. Background patents owned by the collaborator ordinarily need not be licensed to the Government. However, when the Government's contribution is expected to be large, and when the developed item is likely to be needed for Governmental purposes, a license for the Government to use the background patent on a royalty-free basis should be negotiated.

3-13. Allocation of intellectual property rights

During the course of a cooperative effort, patentable inventions or other intellectual property may be developed by the Government, by the collaborator, or jointly. Each of these situations must be covered in the agreement. In the case of inventions made by Government personnel, Commanders or Directors are authorized to license, assign or waive the Government's rights to those inventions. Because the Government desires some control over the development of inventions, and because the Government is interested in having inventions be made available to the public on reasonable terms and conditions, exclusive licensing rather than assigning or waiving the Government's rights, is the preferred method of transferring the technology to the private sector. In return for exclusivity, the Government may expect to receive reasonable royalty payments. Title to inventions made by collaboratory personnel should be retained by the collaborator, subject to a non-exclusive royalty-free license to the Government. Absent unusual circumstances, the collaborator should not be required to pay royalties to the Government on inventions, copyrights or technical data developed by collaborator personnel. In the case of inventions or other intellectual property developed jointly by Government and collaborator personnel, the collaborator would normally assign its rights to the Government and the Government would, in turn, grant an exclusive license to the collaborator. Since both Government and collaborator personnel were jointly involved in the development of the intellectual property, the royalty to the Government, if any, may be nominal. Agreements should be negotiated in a manner serving the U.S. public interest and realizing that transfer to a successful commercial product or process may serve that public interest more than maximum near-term payback to the Army activity.

Section IV
Licensing of Government Owned Inventions

3-14. Authority to grant licenses

This section prescribes the terms, conditions and procedures upon which an existing Army laboratory invention may be licensed by the laboratory Director. The authority for this section is found at 37 CFR 404. Army laboratory inventions shall be made available for licensing as deemed appropriate in the public interest. Army laboratories having custody of inventions may grant non-exclusive, partially exclusive, or exclusive licenses there to under this regulation.

3-15. Restrictions and conditions on all licenses granted under this section

a. The following restrictions are placed on the granting of licenses:

(1) A license may be granted only if the applicant has supplied the laboratory Director with a satisfactory plan for development or marketing of the invention, or both, and with information about the applicant's capability to fulfill the plan.

(2) A license granting rights to use or sell under an Army laboratory invention in the United States shall normally be granted only to a licensee who agrees that any products embodying the invention or produced through the use of the invention will be manufactured substantially in the United States.

b. Licenses shall contain such terms and conditions as the laboratory Director determines are appropriate for the protection of the interests of the Federal Government and the public, and are not in conflict with law or this regulation. The following terms and conditions apply to any license:

(1) The duration of the license shall be for a period specified in the license agreement, unless sooner terminated in accordance with this regulation.

(2) The license may be granted for all or less than all fields of use of the invention or in specified geographical areas or both.

(3) The license may extend to subsidiaries of the licensee or other parties if provided for in the license but shall be non-assignable without approval of the laboratory Director except to the successor of that part of the licensee's business to which the invention pertains.

(4) The license may provide the licensee the right to grant sub-licenses under the license, subject to the approval of the laboratory Director. Each sub-license shall make reference to the license, including the rights retained by the Government, and a copy of such sub-license shall be furnished to the laboratory Director.

(5) The license shall require the licensee to carry out the plan for development or marketing of the invention, or both, to bring the invention to practical application within a period specified in the license, and to continue to make the benefits of the invention reasonably accessible to the public.

(6) The license shall require the licensee to report periodically on the utilization or efforts at obtaining utilization that are being made by the licensee, with particular reference to the plan submitted.

(7) Licenses may be royalty-free or for royalties or other consideration.

(8) Where an agreement is obtained pursuant to the above restriction that any products embodying the invention or produced through use of the invention will be manufactured substantially in the United States, the license shall recite such agreement.

(9) The license shall provide for the right of the laboratory Director to terminate the license, in whole or in part, if:

(a) The laboratory Director determines that the licensee is not executing the plan submitted with its request for a license and the licensee cannot otherwise demonstrate to the satisfaction of the laboratory Director that it has taken or can be expected to take within a reasonable time effective steps to achieve practical application of the invention;

(b) The laboratory Director determines that such action is necessary to meet requirements for public use specified by Federal regulations issued after the date of the license and such requirements are not reasonably satisfied by the licensee;

(c) The licensee has willfully made a false statement or willfully omitted a material fact in the license application or in any report required by the license agreement; or

(d) The licensee commits a substantial breach of a covenant or agreement contained in the license;

(10) The license may be modified or terminated, consistent with this part, upon mutual agreement of the laboratory Director and the licensee;

(11) Nothing relating to the grant of a license, nor the grant itself, shall be construed to confer upon any person any immunity from or defenses under the antitrust laws or from a charge of patent misuse, and the acquisition and use of rights pursuant to this part shall not be immunized from the operation of state or Federal law by reason of the source of the grant.

3-16. Non-exclusive licenses

a. Non-exclusive licenses may be granted under Army laboratory-owned inventions without publication of availability or notice of prospective license.

b. In addition to the provisions of paragraph 3-15, non-exclusive licenses, may also provide that, after termination of a period specified in the license agreement, the laboratory or agency may restrict the license to the fields of use or geographic areas, or both, in which the licensee has brought the invention to practical application and continues to make the benefits of the invention reasonably accessible to the public. However, such restriction shall be made only in order to grant an exclusive or partially exclusive license in accordance with this regulation.

3-17. Exclusive and partially exclusive licenses

a. The following conditions must be met in granting exclusive or partially exclusive domestic licenses:

(1) Exclusive or partially exclusive domestic licenses may be granted on Army laboratory-owned inventions three months after notice of the invention's availability has been announced in the FEDERAL REGISTER, or without such notice where the laboratory Director determines that expeditious granting of such a license will best serve the interest of the Federal Government and the public; and in either situation, only if;

(a) Notice of prospective license, identifying the invention and the prospective licensee, has been published in the FEDERAL REGISTER, providing opportunity for filing written objections within a 60-day period;

(b) After expiration of the 60-day period noted above and consideration of any written objections received during the period, the laboratory Director has determined that the interests of the Federal Government and the public will best be served by the proposed license, in view of the applicant's intentions, plans, and ability to bring the invention to practical application or otherwise promote the invention's utilization by the public; that the desired practical application has not been achieved, or is not likely expeditiously to be achieved, under any non-exclusive license which has been granted, or which may be granted, on the invention; that exclusive or partially exclusive licensing is a reasonable and necessary incentive to call forth the investment of risk capital and expenditures to bring the invention to practical application or otherwise promote the invention's utilization by the public; and that the proposed terms and scope of exclusivity are not greater than reasonably necessary to provide the incentive for bringing the invention to practical application or otherwise promote the invention's utilization by the public;

(c) The laboratory Director has not determined that the grant of such a license will tend substantially to lessen competition or result in undue concentration in any section of the country in any line of commerce to which the technology to be licensed relates, or to create or to maintain other situations inconsistent with the antitrust laws; and

(d) The laboratory Director has given first preference to any small business firms submitting plans that are determined by the laboratory to be within the capabilities of the firms and as equally likely, if executed, to bring the invention to practical application as any plans submitted by applicants that are not small business firms.

(2) In addition to the provisions of paragraph 3-15, the following terms and conditions apply to domestic exclusive and partially exclusive licenses:

(a) The license shall be subject to the irrevocable, royalty-free right of the Government of the United States to practice and have practiced the invention on behalf of the United States and on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.

(b) The license shall reserve to the laboratory Director the right to require the licensee to grant sub-licenses to responsible applicants, on reasonable terms, when necessary to fulfill health or safety needs.

(c) The license shall be subject to any licenses in force at the time of the grant of the exclusive license.

(d) The license may grant the licensee the right of enforcement of the licensed patent pursuant to the provisions of 35 USC 281 et seq., or other statues, as determined appropriate in the public interest.

b. The following conditions must be met in granting foreign exclusive or partially exclusive licenses:

(1) Exclusive or partially exclusive licenses may be granted on an Army laboratory-owned invention covered by a foreign patent, patent application, or other forms of protection, provided that;

(a) Notice of a prospective license, identifying the invention and prospective licensee, has been published in the FEDERAL REGISTER, providing opportunity for filing written objections within a 60-day period and following consideration of such objections;

(b) The laboratory Director has considered whether the interests of the Federal Government or United States industry in foreign commerce will be enhanced; and

(c) The Federal Agency has not determined that the grant of such a license will tend substantially to lessen competition or result in undue concentration in any section of the United States in any line of commerce to which the technology to be licensed relates, or to create or maintain other situations inconsistent with antitrust laws.

(2) In addition to the provisions of paragraph 3-15, the following terms and conditions apply to foreign exclusive and partially exclusive licenses:

(a) The license shall be subject to the irrevocable, royalty-free right of the Government of the United States to practice and have practiced the invention on behalf of the United States and on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.

(b) The license shall be subject to any licenses in force at the time of the grant to the exclusive or partially exclusive license.

(c) The license may grant the licensee the right to take any suitable and necessary actions to protect the licensed property, on behalf of the Federal Government.

c. Laboratory Directors shall maintain a record of determinations to grant exclusive or partially exclusive licenses.

3-18. Applications for a license

An application for a license should be addressed to the laboratory Director having custody of the invention and shall normally include:

a. Identification of the invention for which the license is desired including the patent application serial number or patent number, title, and date, if known;

b. Identification of the type of license for which the application is submitted;

c. Name and address of the person, company, or organization applying for the license and the citizenship or place of incorporation of the applicant;

d. Name, address, and telephone number of the representative of the applicant whom correspondence should be sent;

e. Nature and type of applicant's business, identifying products or services which the applicant has successfully commercialized, and approximate number of applicant's employees;

f. Source of information concerning the availability of a license on the invention;

g. A statement indicating whether the applicant is a small business firm;

h. A detailed description of applicant's plan for development or marketing of the invention, or both which include:

(1) Statement of the time, nature and amount of anticipated investment of capital and other resources which applicant believes will be required to bring the invention to practical application;

(2) A statement as to applicant's capability and intention to fulfill the plan, including information regarding manufacturing, marketing, financial, and technical resources;

(3) A statement of the fields of use for which applicant intends to practice the invention; and

(4) A statement of geographic areas in which applicant intends to manufacture any products embodying the invention and geographic areas where applicant intends to use or sell the invention, or both;

i. Identification of license previously granted to applicant under Federally-owned inventions;

j. A statement containing applicant's best knowledge of the extent to which the invention is being practiced by private industry or Government, or both, or is otherwise available commercially; and

k. Any other information which applicant believes will support a determination to grant the license to applicant.

3-19. Notice to Attorney General

A copy of the notice of prospective license, as published in the federal Register, for all instances as required by in paragraph 3-13 will be sent to the Attorney General.

3-20. Modification and termination of licenses

Before modifying or terminating a license, other than by mutual agreement, the laboratory Director shall furnish the licensee and any sub-licensee of record a written notice of intention to modify or terminate the license, and the licensee and any sub-licensee shall be allowed 30 days after such notice to remedy any breach of the license or show cause why the license shall not be modified or terminated.

3-21. Appeals

The following parties may appeal to the ASARDA any decision or determination made by the laboratory Director concerning the grant, denial, interpretation, modification, or termination of a license:

a. A person whose application for license has been denied;

b. A licensee whose license has been modified or terminated, in whole or part; or

c. A person who timely filed a written objection in response to the notice required by paragraph 3-17 and who can demonstrate to the satisfaction of the ASARDA that such person may be damaged by the laboratory Director's action.

3-22. Protection and administration of invention

A laboratory Director may take any suitable and necessary steps to protect and administer rights to Army laboratory inventions, either directly or through contract.

3-23. Transfer of custody

An Army organization having custody of an Army-owned invention may transfer custody and administration, in whole or in part, to another Army organization.

3-24. Confidentially of information

Any plan submitted pursuant to paragraph 3-18, and any report required by paragraph 3-15, may be treated by the laboratory Director as commercial and financial information obtained from a person as privileged and confidential and not subject to disclosure.

3-25. Royalty rate determination

Reasonable royalty rates should be estimated based on the best commercial licensing practice and negotiated to best accomplish the success of the transferred product or process in the marketplace. The advice of local or assigned intellectual property counsel should be sought in negotiating reasonable royalties.

Section V
Army Review of Agreements

3-26. Review authority

As required by Executive Order 12591, the authority: (1) to enter into CRDAs and (2) to license, assign or waive rights to intellectual property developed by the laboratories or centers either under such CRDAs or from within individual activities has been delegated to the Commanders/Directors of specified Army laboratories and centers. The authority to disapprove or require modification to the arrangements identified in (1) and (2) above is retained by the ASA(RDA) as provided by 15 USC 3710a(c)(5)(A).

3-27. Army review process for CRDAs and PLAs

To allow the timely development of CRDAs and PLAs, the following guidelines are provided:

a. CRDAs and PLAs will be developed by each activity Commander/Director with advice from the intellectual property counsel for the laboratory or center.

b. The final negotiated version of the CRDA or PLA as signed by the activity Commander/Director will be provided with a cover sheet having the following information:

(1) Name of company(ies) with which agreement was made.

(2) Name, address and telephone number of company POC.

(3) Name, address and SSN of inventor(s) (for PLAs only).

(4) Name and phone number of laboratory POC.

(5) Name and phone number of legal counsel for laboratory.

(6) Summary of agreement stating specifically the contributions of each side and noting any unusual provisions.

c. The original and two copies of the completed CRDA or PLA (with cover sheets) will be prepared by the laboratory or center. The original will be sent to the ADTTP Manager, U.S. Army Laboratory Command, ATTN: AMCLD-TT, 2800 Powder Mill Road, Adelphi, Md. 20783-1145, where its receipt will be logged on behalf of the ASARDA, the review will be coordinated, and records of each original CRDA and PLA will be maintained for the Army. At the same time one copy will be sent to the ASARDA, The Pentagon, Washington, DC 20310-1000, and the other copy to the Intellectual Property Counsel of the Army, Office of the Judge Advocate General, 5611 Columbia Pike, Falls Church, VA 22041-5013 for review.

d. The Program Manager, after assuring receipt of copies by each reviewer will acknowledge the receipt of each agreement by a letter to the activity stating a control number and receipt date which officially begins the 30-day period during which the agreement may be disapproved or modification required.

e. The Intellectual Property Counsel will provide legal review and comments to the Program Manager within 21 days of the receipt date.

f. The Program Manager will provide a review of the CRDA or PLA for Army policy issues along with the report of legal findings from the Intellectual Property Counsel and, based on all recommendations, will provide a letter for ASARDA to notify the laboratory or center of the approval or disapproval of the agreement or of any modifications required.

Section VI
Royalties and Other Income

3-28. Management of royalties and other income

The amount, payment schedule and address to receive payments for the payment of royalties and other funds from licensing to the Army under CRDAs and PLAs will be specified in those agreements in accordance with AR 37-1 and its amendments. The use of initial and final payments, the beginning of scheduled payments, and any other payment factors not specified in this regulation or in AR 37-1 and its amendments are left to the discretion of the ORTA in negotiating the agreement. Agreements must also specify that a report identifying the agreement and stating the manner in which the amount of the funds was calculated should be sent with the payment, with copies provided to the ADTTP Manager and the ORTA of the activity responsible for the agreement. The ADTTP Manager is responsible for the distribution of the funds received by the supporting financial office specified in AR 37-1 or its amendments. Funds are first set aside for the holders of intellectual property in accordance with the law and DOD 3200.12-R-4 and residual funds (if any) will be distributed by the ADTTP Manager in accordance with AR 37-1 and its amendments. Any specified percentage of these residual funds not sent to the activity originating the intellectual property will be distributed to Army activities which have comparatively few agreements and request the funds to strengthen their program. Such remaining residual funds will be distributed at the discretion of the ADTTP

Manager based on need and available funds. Funds may be used as specified in the following section of this regulation.

3-29. Uses of royalty income

As required by law, any portion of the royalties or other income distributed to the laboratories or centers by the ADTTP Manager may be used by them in the fiscal year they are received by the laboratory or center, or in the next fiscal year, after which funds are paid into the U.S. Treasury. Any laboratory or center receiving any portion of royalties or other income from technology transfer activities is constrained by the law to use the funds for the following purposes:

a. Payment of expenses incidental to the administration and licensing of inventions by that laboratory or by the Agency with respect to inventions which occurred at that laboratory, including the fees or other costs for the services of other Agencies, persons, or organizations for invention management and licensing services.

b. Reward scientific, engineering, and technical employees of that laboratory.

c. Further scientific exchange among the Government-operated laboratories of the Agency.

d. Education and training of employees consistent with the R&D mission and objectives of the Agency, and for other activities that increase the licensing potential for transfer of the technology of the Government-operated laboratories of the Agency.

Chapter 4
Reports

4-1. Annual report to Congress

As required by law, the Army will report through the Office of Management and Budget (OMB) to the Congress each year, as a part of the annual budget submission, on the domestic technology transfer accomplishment of the Agency and its specified laboratories and centers, and on plans for the coming year in a format provided by the OMB. Information will be collected from each appropriate activity by the ADTTP Manager and prepared in coordination with the Office of the Assistant Secretary of Army (Financial Management) which prepares the budget for OMB.

4-2. Special reports

Due to the recognized importance of enhanced domestic technology transfer from Federal laboratories to the future economic well being of the country, special reports on the implementation of the National policy and the effectiveness of the domestic technology transfer effort at the Agencies are required by DOD, OMB, General Accounting Office, Department of Commerce, and various other Executive Agencies and Congressional Committees. Information for these reports and inquiries will be collected by the ADTTP Manager who will prepare and coordinate the preparation of the reports as needed on behalf of the Army.

Appendix A
References

Section I
Required Publications

AR 37-1

Army Accounting and Fund Control (cited in paras 1-6, 2-9 and 3-28.)

AR 672-20

Decorations, Awards, and Honors Incentive Awards (cited in paras 2-5 and 3-5.)

Section II
Related Publications

5 USC 552

Public Information; Agency Rules, Opinions, Orders, Records, and Proceedings

15 USC 631

Aid to Small Business

15 USC 632

Definition of Small Business Concern

15 USC 3701 et seq.

Stevenson-Wydler Technology Innovation Act of 1980

33 USC 2313

The Water Resources Development Act of 1988

35 USC 209

Restrictions on Licensing of Federally-Owned Inventions

35 USC 281 et seq.

Remedy for Infringement of Patent, and Other Actions

37 CFR 404

Licensing of Government-Owned Inventions

AR 27-60

Patents, Inventions, and Copyrights

AR 600-50

Standards of Conduct

DOD 3200.12-R-4

Domestic Technology Transfer Program Regulation

Executive Order 12591

Facilitating Access to Science and Technology

Glossary

Section I
Abbreviations

ADTTP

Army Domestic Technology Transfer Program

AMC

Army Materiel Command

ASARDA

Assistant Secretary of Army (Research, Development and Acquisition)

CG

Commanding General

CPAR

Construction Productivity Advancement Research

CRDA

Cooperative Research and Development Agreement

DA

Department of the Army

DCSTPM

Deputy Chief of Staff for Technology Planning and Management

DOD

Department of Defense

FLC

Federal Laboratory Consortium

NIST

National Institute of Standards and Technology

NTIS

National Technical Information Service

OMB

Office of Management and Budget

ORTA

Office of Research and Technology Applications

PLA

Patent License Agreement

RDTE

Research, Development, Test and Evaluation

R&D

Research and Development

SBIR

Small Business Innovation Research

TVS

Technical Volunteer Service

Section II
Terms

Applications assessment

A summary emphasizing the potential civilian application of each technological development from Army R&D projects that has potential for successful application to State and local government or for commercialization by private industry.

Army-owned invention

An invention, plant, or design which is covered by a patent, or patent application in the United States, or a patent, patent application, plant variety protection, or other form of protection, in a foreign country, title to which has been assigned to or otherwise vested in the United States Government as represented by the Secretary of the Army.

Civilian Agency

Non-DOD Federal, State, or local government components.

Construction Productivity Advancement Research (CPAR) Program

A program created by the Water Resources Development Act of 1988 for the Corps of Engineers which provides for limited government fund contributions to certain Cooperative Research and Development Agreements developed by the Crops under procedures specified in the Act.

Cooperative Research and Development Agreement (CRDA)

A legal agreement which implements the new authority specified in the Federal Technology Transfer Act of 1986. CRDAs include agreements between one or more Federal laboratories and one or more non-Federal parties under which the laboratory provides personnel, services, facilities, equipment or other resources (but not funds), with or without reimbursement, and the non-Federal parties provide funds, personnel, services, facilities, equipment or other resources toward the conduct of specified research or development efforts which are consistent with the missions of the Army R&D activity. The term does not include procurements, grants or other types of cooperative agreements made under the authority of any other legislation.

Heads of Technology Developing Agencies

These are the Commanders or other Heads of major Army components responsible for the performance of research and development. These include the Commanding General, Army Materiel Command; The Surgeon General; The Chief of Engineers; the Commanding General, Strategic Defense Command; the Commanding General, Information Systems Command; The Deputy Chief of Staff for Personnel; and, the Heads of other equivalent organizations which may be made responsible for the performance of R&D within the Army.

Laboratory invention

An invention in the custody of an Army laboratory or center. An invention is considered to be in the custody of an Army laboratory or center if the invention was made in whole or in part by an employee or former employee of that organization; was developed under a contract awarded or technically administered by the laboratory; or falls most closely within the technical mission of the laboratory or center at the time invention is proposed for licensing.

National Institute of Standards and Technology (NIST)

An element of the Department of Commerce, formerly called the National Bureau of Standards, which has responsibility under 15 USC 3710 (e)(7)(A) for collecting and administering funds on behalf of the Federal Laboratory Consortium.

National Technical Information Service (NTIS)

An element of the Department of Commerce which serves as a clearing house for collecting, disseminating, and transferring technical information having potential for use by the private sector and civilian agencies. It cooperates with the Offices of Research and Technology Applications (ORTA) of the Federal laboratories in disseminating information on laboratory technology.

Partnership intermediary

This term means an agency of a State or local government or a nonprofit entity owned in whole or in part by, chartered by, funded in whole or in part by, or operated in whole or in part by or on behalf of a State or local government, that assists, counsels, advises, evaluates, or otherwise cooperates with small business firms that need or can make demonstrably productive use of technology related assistance from a Federal laboratory.

Patent License Agreement (PLA)

A legal agreement which grants a license to use or practice an Army invention.

Practical application

To manufacture in the case of a composition or product, to practice in the case of a process or method, or to operate in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that its benefits are to the extent permitted by law or Government regulations available to the public on reasonable terms.

Research and Development laboratory budget

This consists of all Program 6 "Research and Development" resources as defined in the DOD Planning, Programming, and Budget System that is allocated to the Army's laboratories and centers.

Small business firm

This term is the same as that used in Army procurement. It is precisely defined by 15 USC 632, the implementing regulations of the Administrator of the Small Business Administration.

Specified laboratories and centers

All Army R&D laboratories and centers which conform to the definition of a "Federal laboratory" in 15 USC 3703 (6). This applies to Army organizations responsible for R&D that are deemed by the ASARDA as producing significant research results appropriate for transfer to civilian applications in the United States.

Technology transfer

The process of cooperatively adapting existing DA R&D results, technology, or technical know-how to meet civilian needs. Technology transfer is also the process of matching the solutions resulting from DA programs in the form of existing science and engineering knowledge and capabilities to the problems of industry or the public.

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6/13/91

CRDAs AND PLAs APPROVED BY ARMY

Total Approved CRDAs: 90 Total Approved PLAs: 12

Control No.	
9105-M-C099	CRDA between MRDC, Medical Research Institute of Chemical Defense and John Hopkins University for research and development on the neurotoxin characterization of a Human Cortical Cell Line (HCN-1A). **POC: Mr. John Blische, (301) 671-3948, APP: JUN 91**
9105-M-C098	CRDA between MRDC, Walter Reed Army Institute of Research and Cambridge Biotech for research and development on novel adjuvants for vaccines against malaria. **POC: LTC Willis A. Reid, (202) 576-3061, APP: MAY 91**
9105-A-C097	CRDA between Aviation Applied Technology Directorate and The Carborundum Company for evaluation of new .ceramic based armors. **POC: Mr. Laurence Smail, (804) 878-5831, APP: MAY 91**
9104-M-C096	CRDA between MRDC, Institute of Dental Research and the University of Pennsylvania for research and development on improved diagnostic three-dimensional sensing, detection, recognition, and reconstruction of anatomic spatial forms, anomalies, deficiencies, and pathologies for new treatment modalities. **POC: Dr. Jean Setterstrom, (202) 576-3483, APP: MAY 91**
9104-E-C095	CRDA between COE, Cold Regions Research and Engineering Laboratory and AMOCO Production Company, Inc. for conducting small-scale indentation tests using wide indentors with respect to ice thickness and to study non-simultaneous ice crushing for application in the design of Artic off-shore oil production structures. **POC: Mr. Peter Smallidge, (603) 646-4445, APP: MAY 91**
9104-E-C094	CRDA between COE, Construction Engineering Research Laboratory and Intergraph for software development. **POC: Mr. Robert Gorham, (217) 373-6789, APP: MAY 91**
9103-A-C093	CRDA between Electronics Technology and Devices Laboratory and Shipley Company, Inc. for the development of improved electron beam sensitive resists for use in the microelectronics industry. **POC: Mr. Richard Stern, (201) 544-4666, APP: APR 91**
9103-E-C092	CRDA between COE, Cold Regions Research and Engineering Laboratory and Advanced Marine Enterprises,. Inc. for studies of icing on turbine weather inlet louvers designed for U.S. Navy DDG51 vessels. **POC: Mr. Peter Smallidge, (603) 646-4445, APP: MAR 91**
9103-E-C091	CRDA between COE, Cold Regions Research and Engineering Laboratory and Dean Consulting and Research Associates, Inc. for conducting investigations on frazil ice involving specialized testing and measurement equipment. **POC: Mr. Peter Smallidge, (603) 646-4445, APP: APR 91**

9102-M-C089 CRDA between MRDC, Walter Reed Army Institute of Research and CBA International, Inc. for research on the effects of tetrandrine and its derivatives and/or analogs against malaria and multidrug resistant malaria.
POC: LTC Wilis A. Reid, (202) 576-3061, APP: MAR 91

9102-M-C088 CRDA betwen MRDC, Medical Research Institute of Chemical Defense and Texas A&M University for development of clinical assay kit for the estimation of pyridostigmine in biological samples.
POC: Mr. John Blische, (301) 671-3948, APP: MAR 91

9102-M-C087 CRDA between MRDC, Medical Research and Development Command and California Department of Health Services for the evaluation of the effectiveness in infant botulism of Botulism Human Immune Globulin (BB-IND 1332).
POC: Mr. Jay Winchester, (301) 663-2065, APP: MAR 91

9102-A-C086 CRDA between Harry Diamond Laboratories and Integrated Technologies for Medicine, Inc., for fabrication and evaluation of microfluidic components.
POC: Ms. Mary Binseel, (301) 394-2952, APP: MAR 91

9102-M-C085 CRDA between MRDC, Walter Reed Army Institute of Research and University of Georgia Research Foundation, Inc., to collaborate in research and development on Acute Toxemic Schistosomiasis Modeling and Drug Development.
POC: LTC Willis A. Reid, (202) 576-3061, APP: FEB 91

9101-M-C084 CRDA between MRDC, Walter Reed Army Institute of Research and MedImmune, Inc., to collaborate in R&D on cloning genes for antigens into new expression systems of potential value in a malaria vaccine.
POC: LTC Willis A. Reid, (202) 576-3061, APP: FEB 91

9101-A-C083 CRDA between Harry Diamond Laboratories and Virginia Polytechnic Institute and State University to jointly develop, test and evaluate the use of fluidic technologies coupled with fiber optic systems.
POC: Ms. Mary Binseel, (301) 394-2952, APP: FEB 91

9101-A-P082 PLA between Electronics Technology and Devices Laboratory and Ball Corporation for a partially exclusive license for a Dual Mode Quartz Thermometric Sensing Device.
POC: Mr. Richard Stern, (201) 544-4666, APP: JAN 91

9101-A-P081 PLA between Electronics Technology and Devices Laboratory and Frequency Electronics, Inc. for a partially exclusive license for a Dual Quartz Thermometric Sensing Device.
POC: Mr. Richard Stern, (201) 544-4666, APP: JAN 91

9101-A-P080 PLA between Electronics Technology and Devices Laboratory and Motorola Inc. for a partially exclusive license for a Dual Mode Quartz Thermometric Sensing Device.
POC: Richard Stern, (201) 544-4666, APP: JAN 91

9101-A-P079 PLA between Electronics Technology and Devices Laboratory and Piezo Crystal Company for a partially exclusive license for a Dual Mode Quartz Thermometric Sensing Device.
POC: Mr. Richard Stern, (201) 544-4666, APP: JAN 91

9101-A-P078 PLA between Electronics Technology and Devices Laboratory and Piezo Technology, Inc. for a partially exclusive license for a Dual Mode Quartz Thermometric Sensing Device.
POC: Mr. Richard Stern, (201) 544-4666, APP: JAN 91

9101-A-P077 PLA between Electronics Technology and Devices Laboratory and Q-Tech Corporation for a partially exclusive license for a Dual Mode Quartz Thermometric Sensing Device.
POC: Mr. Richard Stern, (201) 544-4666, APP: JAN 91

9101-A-P076 PLA between Electronics Technology and Devices Laboratory and Vectron Laboratories, Inc. for a partially exclusive license for a Dual Mode Quartz Thermometric Sensing Device.
POC: Mr. Richard Stern, (201) 544-4666, APP: JAN 91

9012-M-C075 CRDA between MRDC, Walter Reed Army Institute of Research and University of Maryland School of Medicine for development of attenuated strains that can serve as vaccines or as carrier strains and to develop methods to express foreign DNA in carrier stains for further development of carrier vaccines.
POC: LTC Willis A. Reid, (202) 576-3061, APP: JAN 91

9011-A-C074 CRDA between Chemical Research and Development Engineering Center and Murray Corporation to provide spectral data and other analysis for the development of alternative refrigerants for use in automobile air conditioning units.
POC: Ms. Susan Luckan, (301) 671-2031, APP: DEC 90

9011-A-C073(R)CRDA between Materials Technology Laboratory and PPG Industries, Inc. for characterization and possible further development of oxynitride glass fibers.
POC: Dr. Hamed El-Bisi, (617) 923-5396, APP: MAR 91

9011-A-C072 CRDA between Aviation Applied Technology Directorate and Inductron Corporation to develop and evaluate a portable field repair system for advanced composite aircraft structures.
POC: Mr. Laurence Smail (804) 878-5831, APP: DEC 90

9010-A-C071 CRDA between Electronics Technology and Devices Laboratory and Norden Systems, Inc. for development of a portable flat panel display workstation.
POC: Mr. Richard Stern, (201) 544-4666, APP: NOV 90

9101-M-C070(R)CRDA between MRDC, Biomedical Research and Development Laboratory and 3M Company for development of a new innovative composite insect/arthropod repellent formulation.
POC: Ms. Karen Pritz, (301) 663-2024, APP: JUN 91

9010-M-C069 CRDA between MRDC, Medical Research Institute of Chemical Defense
and Ausimont USA, Inc. to test and evaluate perfluorinated polyethers
and mixtures of these and other materials as candidate topical protectants
to chemical warfare agents.
POC: Mr. John Blische, (301) 671-3948, APP: OCT 90

9010-M-C068 CRDA between MRDC, Walter Reed Army Institute of Research and Specialty
Laboratories for collecting specimens from patients infected with
Japanese Encephalitis and Dengue Fever for use in quality assurance
checks of a diagnostic kit already developed.
POC: LTC Willis A. Reid, (202) 576-3061, APP: OCT 90

9009-M-C067(R)CRDA between MRDC, Medical Research Institute of Infectious Diseases
and Marcel Dekker, Inc. for collaborating on certain chapters of
the handbook of Natural Toxins, VOL. 7: Food Poisoning, publishing
information developed at the laboratory.
POC: Dr. Robert Rosato, (202) 663-2775, APP: MAR 91

9009-A-P066(R)PLA between Harry Diamond Laboratories and Defense Research Technologies,
Inc. for fluidic mud pulsers.
POC: Ms. Mary Binneel, (301) 394-2952, APP: NOV 90

9009-M-C065 CRDA between MRDC, Research Institute of Environmental Medicine
and Gillette Company for development of an antiperspirant that reduces
pedal perspiration with minimal irritant dermatitis.
POC: Dr. Murray P. Hamlet, (508) 651-4865, APP: SEP 90

9009-M-C064 CRDA between MRDC, Walter Reed Army Institute of Research and Genetech,
Inc. to conduct and evaluate research on the safety and immunogenicity
of rgp120/HIV-1 (IIIB) vaccine.
POC: LTC Willis A. Reid, (202) 576-3061, APP: SEP 90

9009-M-C063(R)CRDA between MRDC Letterman Army Institute of Research and ReGen
Corporation to continue cooperative development and testing of prosthetic
devices suitable for implantation into humans.
POC: Mr. Jack Keller, (415) 561-2641, APP: JAN 91

9008-A-C062 CDRA between Electronics Technology and Devices Laboratory; Communications
and Electronics Command, Research Development and Engineering Center;
and Rutgers, The State University of New Jersey to advance the development
of ultra high speed and millimeter wave electronic devices.
POC: Mr. Richard Stern, (201) 544-4666, APP: SEP 90

9008-M-C061 CDRA between MRDC, Institute of Dental Research and Amgen Inc. to
collaborate in R&D on growth factors in bone healing in an animal
model.
POC: Dr. Jean Setterstrom, (202) 576-3484, APP: SEP 90

9007-M-C059 CRDA between MRDC, Medical Material Development Activity and The
National Bacteriological Laboratory to cooperate in the continued
research and investigation of the live tularemia vaccine.
POC: Mr. Jay Winchester, (301) 663-2065, APP: AUG 90

9007-M-C058 CRDA between MRDC, Medical Research Institute of Infectious Diseases and Eli Lilly and Company for exchange of test results and/or chemical structure decriptions attempting to identify non-toxic analogs of the antiviral drug pyrazofurin.
POC: Dr. Robert Rosato, (301) 663-2775, **APP: AUG 90**

9007-A-C057 CRDA between Natick Research, Development and Engineering Center and Procor Technologies to develop a fully instantized dental liquid ration.
POC: Mr. Robert Rosenkrans, (508) 651-5296, **APP: JUL 90**

9006-A-C056 CRDA between Harry Diamond Laboratories and M/A-COM to perform cooperative research, test and evaluate the operation and damage characteristics of solid-state PIN diodes.
POC: Ms. Mary Binseel, (301) 394-2952, **APP: JUL 90**

9006-A-C055 CRDA between Harry Diamond Laboratories and McDonnell Douglas Corporation to design, develop, evaluate and test Artificial Intelligence/expert computer software systems and their supporting technologies such as terrain reasoning.
POC: Ms. Mary Binseel, (301) 394-2952, **APP: JUL 90**

9006-M-C054 CRDA between MRDC, Medical Research Institute of Infectious Diseases and Microbiological Associates, Inc. to develop reagents for tests to isolate filoviruses, continue research and development on refining existing tests and to develop new tests,
POC: Dr. Robert Rosato, (301) 663-2775, **APP: JUL 90**

9006-A-C053 CRDA between Harry Diamond Laboratories and Rockwell International Corporation to test and evaluate automated 3-D X-Ray equipment in a production environment.
POC: Ms. Mary Binseel, (301) 394-2952, **APP: JUL 90**

9005-A-C052 CRDA between Harry Diamond Laboratories and Grumman Aerospace Corporation to test and evaluate an analog electronic device to clip or limit the amplitude of a transmission signal.
POC: Ms. Mary Binseel, (301) 394-2952, **APP: JUL 90**

9005-E-C051 CRDA between COE, Cold Regions Research and Engineering Laboratory and North American Shipbuilding, Inc. to conduct model tests in ice of the design of a polar research vessel.
POC: Mr. Peter Smallidge, (603) 646-4445, **APP: JUL 90**

9005-M-C050 CRDA between MRDC, Medical Research Institute of Infectious Diseases and the University of Illinois at Urbana-Champaign to further the development and manufacture of biologicals, including but not limited to, vaccines.
POC: Dr. Robert Rosato, (301) 663-2775, **APP: JUN 90**

9005-M-C049 CRDA between MRDC, Walter Reed Army Institute of Research and World Health Organization for the development of drugs, vaccines and other medical products for the prevention and treatment of malaria and other parasitic and infectious diseases.
POC: LTC Willis A. Reid, (202) 576-3061, **APP: JUN 90**

9005-M-C048	CRDA between MRDC, Walter Reed Army Institute of Research and Virogenetics Corporation to collaborate in research and development on immunologic approaches to prevent and treat infectious diseases by using recombinant viral vectors. **POC: LTC Willis A. Reid, (202) 576-3061, APP: JUN 90**
9005-M-C047	CRDA between MRDC, Walter Reed Army Institute of Research and Squibb Institute for Medical Research to exchange technical information and material relating to the field of amphotericin B lipid complex. **POC: LTC Willis A. Reid, (202) 576-3061, APP: JUN 90**
9004-M-C046	CRDA between MRDC, Medical Research Institute of Infectious Diseases and Viratek, Inc. to collaborate in the development of the antiviral drug ribavirin. **POC: Dr. Robert Rosato, (301) 663-2775, APP: MAY 90**
9004-M-C045	CRDA between MRDC, Medical Research Institute of Infectious Diseases and Rhone Merieux Laboratoire IFFA to evaluate the safety and efficacy of a vaccine against Rift Valley Fever (RVF). **POC: Dr. Robert Rosato, (301) 663-2775, APP: APR 90**
9004-M-C044	CRDA between MRDC, Walter Reed Army Institute of Research and Univax Corporation to collaborate in a study on the use of specific antisera that possess high levels of neutralizing antibodies. **POC: LTC Willis A. Reid, (202) 576-3061, APP: APR 90**
9003-M-C043	CRDA between MRDC, Medical Materiel Development Activity and The Swiss Serum and Vaccine Institute, Bern for development of Klebsiella/Pseudomonas Immune Globulins for intravenous injection. **POC: Mr. Jay Winchester, (301) 663-2065, APP: APR 90**
9003-M-C042	CRDA between MRDC, Medical Materiel Development Activity and The Swiss Serum and Vaccine Institute, Bern for the product evaluation of vaccines for the prevention of opportunistic gram-negative infections. **POC: Mr. Jay Winchester, (301) 663-2065, APP: APR 90**
9003-A-C041	CRDA between Army Chemical Research Development and Engineering Center and Dow Chemical Corporation for testing quantities of Q5-6603 polymer against chemical warfare agents. **POC: Ms. Susan Luckan, (301) 671-2031, APP: APR 90**
9003-E-P040	PLA between COE, Construction Engineering Research Laboratory and Evans Machine and Tool Company for pipe test loop for evaluating quality of potable water supply. **POC: Mr. Robert Gorham, (217) 373-6789, APP: APR 90**
9002-A-C039	CRDA between Tank-Automotive Command and OptiMetrics Inc. for further development of computer programs developed by TACOM for distribution to private and government users. **POC: Mr. Robert Hostetler, (313) 574-5270, APP: MAR 90**

9002-A-C038	CRDA between Electronics Technology and Devices Laboratory and Martin Marietta Corporation for development of a permanent magnet system for a microwave tube. POC: **Mr. Richard Stern**, (201) 544-4666, APP: MAR 90
9001-M-C037	CRDA between MRDC, Walter Reed Army Institute of Research and MicroGeneSys, Inc. to collaborate in evaluation of a vaccine for effectiveness against human immunodeficiency virus. POC: **LTC Willis A. Reid**, (202) 576-3061, APP: FEB 90
8912-A-C036	CRDA between Harry Diamond Laboratories and J & S Software Development Corporation for development of systems operation software which would be applicable for large IBM compatible environments. POC: **Ms. Mary Binseel**, (301) 394-2952, APP: JAN 90
8912-A-C035	CRDA between Materials Technology Laboratory and Watertown Arsenal Manufacturing Development Park, Inc. for development of advanced automated manufacturing systems. POC: **Dr. Hamed El-Bisi**, (617) 923-5396, APP: JAN 90
8911-M-C034	CRDA between MRDC, Medical Research Institute of Chemical Defense and E. I. DuPont and Company to collaborate in the evaluation of perfluorinated polyethers and mixtures of these and other materials as candidate topical protectants. POC: **Mr. John Blische**, (301) 671-3948, APP: NOV 89
8911-A-C033	CRDA between Electronics Technology and Devices Laboratory and EMCORE Corporation, American Cyanamid Company, and Polytechnic University to investigate how to improve the quality of OMVPE-grown structures and to attempt to find substitutes for highly toxic gases. POC: **Mr. Richard Stern**, (201) 544-4666, APP: DEC 89
8910-M-C032	CRDA between MRDC, Walter Reed Army Institute of Research and Nova to collaborate in research and development on polyanhydride polymers as vehicles for vaccines. POC: **LTC Willis A. Reid**, (202) 576-3061, APP: NOV 89
8910-M-C031	CRDA between MRDC, Walter Reed Army Institute of Research and Nova to collaborate in research and development on targeted delivery of liposomes to lung. POC: **LTC Willis A Reid**, (202) 576-3061, APP: NOV 89
8910-M-C030	CRDA between MRDC, Medical Materiel Development Activity and ConvaTec for the product evaluation of a dressing containing 1% silver sulfadiazine. POC: **Mr. Jay Winchester**, (301) 663-2065, APP: NOV 89
8909-A-C029	CRDA between Electronics Technology and Devices Laboratory and Martin Goffman Associates for development of optical, infrared, and microwave detectors using superconducting technology. POC: **Mr. Richard Stern**, (201) 544-4666, APP: OCT 89

8909-A-C028 CRDA between Harry Diamond Laboratories and Logical Technical Services Corporation for development of a laser microscopy system for the commercial market.
POC: Ms. Mary Binseel, (301) 394-2952, APP: OCT 89

8909-M-C027 CRDA between MRDC, Medical Materiel Development Activity and Minnesota Mining and Manufacturing Company (3M) for evaluating information, data and samples relating to a transdermal patch containing an antimicrobial dressing useful in the treatment of burns, cuts and minor wounds.
POC: Mr. Jay Winchester, (301) 663-2065, APP: OCT 89

8909-M-C026 CRDA between MRDC, Medical Research Institute of Chemical Defense and the University of South Carolina for screening and testing of monoethylcholine and N-amino-deanol and exchanging technical information related to the compounds.
POC: Mr. John Blische, (301) 671-3948, APP: OCT 89

8909-M-C025 CRDA between MRDC, Medical Research Institute of Chemical Defense and Astra Meditec AB for evaluating the development of potential wet/dry autoinjectors which have a possible military medical application.
POC: Mr. John Blische, (301) 671-3948, APP: OCT 89

8908-A-C024 CRDA between Materials Technology Laboratory and Owens-Corning Fiberglas Corporation for conducting tensile testing and chemical analysis of specimens of novel oxynitride glass fibers.
POC: Dr. Hamed El-Bisi, (617) 923-5396, APP: SEP 89

8908-A-C023 CRDA between Electronics Technology and Devices Laboratory and EMC Technology, Inc. for designing, developing and evaluating high performance digitally programmable altenuators, components, circuits and subassemblies.
POC: Mr. Richard Stern, (201) 544-4666, APP: SEP 89

8908-M-C022 CRDA between MRDC, Aeromedical Research Laboratory and Siegel Institute for collaborating in research and development on neural generators of brain activity associated with evoked potentials.
POC: Ms. Diana Hemphill, (205) 255-6907, APP: SEP 89

8907-M-C021 CRDA between MRDC, Medical Research Institute of Infectious Diseases and Swenko R&D, Inc. for the exchange of technical information and material to further the development of medical products for military medical purposes.
POC: Dr. Robert Rosato, (301) 663-2775, APP: AUG 90

8906-M-C020 CRDA between MRDC, Aeromedical Research Laboratory and GENTEX Corporation for the exchange of technical information and material to further the development of improved life support and personnel protective devices, systems and components.
POC: Ms. Diana Hemphill, (205) 255-6907, APP: JUN 89

8906-M-C019 CRDA between MRDC, Medical Research Institute of Chemical Defense and Medimech Limited for the product evaluation of the Binary Autoinjector System.
POC: Mr. John Blische, (301) 671-3948, APP: JUN 89

8905-A-C018 CRDA between Electronics Technology and Devices Laboratory and Research Triangle Institute for E-Beam Probing of Differential Cascode Voltage Switch (DCVS).
POC: Mr Richard Stern, (201) 544-4666, APP: JUN 89

8905-M-C017 CRDA between MRDC, Medical Materiel Development Activity and PROCOR Technologies, Inc., for exchanging technical information and material to further the development of a new drug application for approval of the Food and Drug Administration.
POC: Mr. Jay Winchester, (301) 663-2065, APP: JUN 89

8905-M-C016 CRDA between MRDC, Medical Research Institute of Infectious Diseases and Cetus Corporation for exchaning technical information and material to further the development of medical products for military medical purposes.
POC: Dr. Robert Romato, (301) 663-2775, APP: JUN 89

8905-M-C015 CRDA between MRDC, Army Institute of Dental Research and the University of California, San Francisco for conducting collaborative research on ceramic dental instruments, maxillofacial prosthodontic materials, and new adhesives in dentistry.
POC: Dr. Jean Setterstrom, (202) 576-3484, APP: JUN 89

8904-M-C014 CRDA between MRDC, Medical Materiel Development Activity and Marion Laboratories, Inc., for preclinical trials, using a transdermal dressing containing an antimicrobial, in animals and environmental and durability tests.
POC: Mr. Jay Winchester, (301) 663-2065, APP: MAY 89

8904-M-C013 CRDA between MRDC, Walter Reed Army Institute of Research and Smith Kline & French Laboratories, for Phase I clinical trials in HIV-infected research subjects.
POC: LTC Willis A. Reid, (202) 576-3061, APP: MAY 89

8903-M-C012(R) CRDA between MRDC, Walter Reed Army Institute of Research and TEVA Pharmaceutical, Inc. for clinical trials on an ointment for application as a topical antilieshmanial drug.
POC: LTC Willis A. Reid, (202) 576-3061, APP: AUG 89

8902-M-C011 CRDA between MRDC, Medical Research Institute of Infectious Diseases and Harbor Branch Oceanographic Institution, Inc. to exchange technical information and material to further the development of medical products for military medical purposes.
POC: Dr. Robert Romato, (301) 663-2775, APP: MAR 89

8902-E-P010 PLA between COE, Cold Regions Research and Engineering Laboratory and Cor-A-Vent Inc., for Blister Pressure Relief Valve.
POC: Mr. Peter Smallidge, (603) 646-4445, APP: MAR 89

8901-M-C009	CRDA between MRDC, Walter Reed Army Institute of Research and The Alton Ochsner Medical Foundation, to provide for cardiology studies to complete a protocol to evaluate an implantable intravascular endroprostesis in animals. **POC: LTC Willis A. Reid, (202) 576-3061,**	**APP: FEB 89**
8811-M-C008	CRDA between MRDC, Letterman Army Institute of Research and Telios Pharmaceuticals for exchange of technical information and material to further the development of medical products. **POC: Mr. Jack Keller, (415) 561-2641,**	**APP: DEC 88**
8811-M-C007	CRDA between MRDC, Medical Materiel Development Activity and Survival Tech, Inc., for development of a morphine 10 mg autoinjector. **POC: Mr. Jay Winchester, (301) 663-2065,**	**APP: DEC 88**
8811-M-C006	CRDA between MRDC, Medical Materiel Development Activity and Medimech Limited, for development of a morphine 10 mg autoinjector. **POC: Mr. Jay Winchester, (301) 663-2065,**	**APP: DEC 88**
8809-A-C005	CRDA between Electronics Technology and Devices Laboratory and Electromagnetic Sciences, Inc., for testing and evaluating millimeter wave ferrit control devices for high power applications which will be required in Army system applications. **POC: Mr. Richard Stern, (201) 544-4666,**	**APP: OCT 88**
8806-E-C004	CRDA between the COE, Construction Engineering Research Laboratory and ISICAD, Inc., for the development of software. **POC: Mr. Robert Gorham, (217) 373-6789,**	**APP: AUG 88**
8806-A-C003	CRDA between the Electronics Technology and Devices Laboratory and Trontech, Inc., for development of high frequency oscillators and amplifiers. **POC: Mr. Richard Stern, (201) 544-4666,**	**APP: JUL 88**
8804-A-C002	CRDA between the Materials Technology Laboratory and Dow Chemical Company, for early development of advanced ceramic engine components and advanced lightweight armor applications. **POC: Dr. Hamed El-Bisi, (617) 923-5396,**	**APP: JUL 88**
8803-M-C001	CRDA between the MRDC, Walter Reed Army Institute of Research and Medicis Corporation, for the development of pharmaceutical product,and technologies. **POC: LTC Willis A. Reid, (202) 576-3061,**	**APP: JUL 88**
Unnumbered	CRDA between COE, Construction Engineering Research Laboratory and Electronic Courseware Systems, Inc., for the improvement for commercial sale of a program to teach the use of the AutoCAD Teaching Assistant Program. **POC: Mr. Robert Gorham, (217) 373-6789.**	

Unnumbered	CRDA between the COE, Waterways Experiment Station and Avery Structures, Inc., for a roller compacted concrete pavement system. **POC: Mr. Phillip Stewart, (601) 634-4113.**
Unnumbered	CRDA between the COE, Construction Engineering Research Laboratory and Automated Sciences Group, Inc., for a voice activated inspection system. **POC: Mr. Robert Gorham, (217) 373-6789.**
Unnumbered	PLA between the COE, Construction Engineering Research Laboratory and APS-Materials, Inc., for exclusive license of ceramic anodes. **POC: Mr. Robert Gorham, (217) 373-6789.**
Unnumbered	PLA between the COE, Construction Engineering Research Laboratory and National Standard Company for exclusive license of weld quality monitor. **POC: Mr. Robert Gorham, (217) 373-6789.**

(R) Revised CRDA/PLA approved.

ARMY's 42 DESIGNATED LABs/CTRs AND ORTA POCs

DCSPER

- Research Institute for Behavioral & Social Sciences	Dr. Beatrice Farr

CHIEF OF ENGINEERS

- Cold Regions Research and Engineering Laboratory	Peter Smallidge
- Construction Engineering Research Laboratory	Rob Gorham
- Engineer Topographic Laboratories	George Simcox
- Engineer Waterways Experiment Station	Philip Stewart
- Institute for Water Resources	Darrell Nolton
- Hydrologic Engineering Center	Arlen Feldman

THE SURGEON GENERAL

US Army Medical Research & Development Command	
- Aeromedical Research Laboratory	Diana Hemphill
- Medical Research Institute of Chemical Defense	John Blische
- Institute of Dental Research	Dr. Jean Setterstrom
- Institute of Surgical Research	MAJ Richard Jocz
- Letterman Army Institute of Research	Jack Keller
- Biomedical Research & Development Laboratory	Karen Fritz
- Medical Research Institute of Infectious Diseases	Dr. Robert Rosato
- Research Institute of Environmental Medicine	Dr. Murray Hamlet
- Walter Reed Army Institute of Research	LTC Willis Reid

INFORMATION SYSTEMS COMMAND

- Army Institute for Research in Management Information, Communication & Computer Sciences (AIRMICS)	Dan Hocking

US ARMY MATERIEL COMMAND

US Army Armament, Munitions and Chemical Command	
- Armament Research, Development & Engineering Center	Bob Zanowicz
- Chemical Research, Development & Engineering Center	Susan Luckan
- Benet Laboratories	Gary Conlon
US Army Aviation Systems Command	
- Aviation Research, Development & Engineering Center	Roy Warhover
- Aeroflightdynamics Directorate	Andrew Kerr
- Propulsion Directorate	Robert Bill
- Aerostructures Directorate	John Cline
- Aviation Applied Technology Directorate	Laurence Smail
- Avionics Research and Development Activity	Henry Martinez
US Army Communications-Electronics Command	Norman Taupeka
- Center for Command, Control & Communications Systems	Charles Grzenda
- Center for Electronic Warfare/Reconnaissance, Surveillance, & Target Acquisition	Clinton Brown
- Center for Software Engineering	George Sumrall
- Center for Night Vision & Electro-Optics	Richard Fulton
- Center for Signal Warfare	Bill Mitchell
US Army Missile Command	
- Research, Development & Engineering Center	Warren Alford
US Army Tank-Automotive Command	
- Research, Development & Engineering Center	Robert Hostetler
US Army Troop Support Command	
- Belvoir Research, Development & Engineering Center	Connie Harrisson
- Natick Research, Development & Engineering Center	Robert Rosenkrans
US Army Laboratory Command	
- Atmospheric Sciences Laboratory	Odell Jonhson
- Ballistic Research Laboratory	Richard Dimmick
- Electronics Technology & Devices Laboratory	Richard Stern
- Harry Diamond Laboratory	Mary Binseel
- Human Engineering Laboratory	Dr. Benjamin Cummings
- Materials Technology Laboratory	Dr. Hamed El-Bisi
- Vulnerability Assessment Laboratory	Donald Hemingway

STRATEGIC DEFENSE COMMAND	MAJ Dale McDonough

NASA

National Aeronautics and
Space Administration

Washington, D.C.
20546

Office of the Administrator

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The Honorable Thomas S. Foley
Speaker of the House of Representatives
Washington, DC 20515

Dear Mr. Speaker:

Public Law 101-189, the FY 1990 Department of Defense Authorization Act, amended Section 11(b) of the Stevenson-Wydler Technology Innovation Act of 1980, by directing each relevant Federal agency to prepare and submit to the Congress an annual report describing its technology transfer program for the preceding year and the agency's plans for conducting its technology transfer function for the upcoming year. Such reports are to include plans for securing intellectual property rights for laboratory innovations with commercial promise and plans for managing such innovations so as to enhance the competitiveness of United States industry.

I am pleased to transmit to you the second annual report of the National Aeronautics and Space Administration required by the amended Stevenson-Wydler Act. The first annual report submitted by NASA (for the period 1989-1990) included an in-depth discussion of the basic policies, procedures, mechanisms, and organizations involved in carrying out the agency's technology transfer and intellectual property programs in order to establish a baseline for subsequent annual reports. Accordingly, this report (for the period 1990-1991) provides a summary of specific accomplishments for the past year and plans for the year ahead, and is divided into two sections, one concerning technology transfer and the other concerning intellectual property.

Sincerely,

Richard H. Truly
Administrator

Enclosure

A REPORT TO CONGRESS

TECHNOLOGY TRANSFER REPORT

Fiscal Year 1991

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, DC 20546

[This report is submitted in accordance with provisions of Public Law 101-189, dated November 29, 1989, amending Section 11(b) of the Stevenson-Wydler Technology Innovation Act of 1980 (U.S.C. 3710(b))]

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4. Nationwide Technology Transfer Network
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6. AdaNET Program Development
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PREFACE

Section 11(b) of the Stevenson-Wydler Technology Innovation Act of 1980 (as amended by Public Law 101-189) requires each federal agency to prepare and submit to the Congress an annual report describing its technology transfer program for the preceding year and the agency's plans for the coming year. Such reports are also to include plans for securing intellectual property rights in laboratory innovations with commercial promise and plans for managing such innovations so as to enhance the competitiveness of United States industry.

This report presents to the Congress the accomplishments and plans concerning such activities of the National Aeronautics and Space Administration (NASA) for the period 1990-1991. This report is divided into two sections:

Section I: Technology Transfer and Utilization

Section II: Securing and Managing Intellectual Property Rights

The first annual report submitted by NASA (for the period 1989-1990) included an in-depth discussion of the basic policies, procedures, mechanisms, and organizations involved in carrying out the agency's technology transfer and intellectual property programs to establish a baseline for subsequent annual reports. Accordingly, this report provides a summary of specific accomplishments for the past year, and plans for the year ahead.

SECTION I

TECHNOLOGY TRANSFER AND UTILIZATION

I-1. Summary of Activities for the Preceding Year

In its FY 1991 Authorization Report, the House Committee on Science, Space, and Technology recognized the contributions that NASA's technology utilization activities have made to the Nation's economy through its existing technology transfer mechanisms. The Committee noted that such efforts as the network of Industrial Applications Centers (IAC), technology utilization officers and applications teams "constitute a strong effort by NASA to assist nonaerospace as well as aerospace firms in finding applications in the private sector for federally-developed technologies." The report also stated that, "Since NASA has taken the lead in establishing such technology transfer mechanisms, the Committee encourages other federal agencies interested in commercializing technologies to avoid unnecessary duplication and work in concert with NASA to build upon these existing technology transfer resources."

This encouragement by the House Committee on Science, Space, and Technology set the tone for NASA's efforts in technology transfer during this past year. Where practical and appropriate, NASA has undertaken several specific steps to encourage greater participation by other federal agencies in its established technology transfer infrastructure. Such steps have included:

a. Participation by the Federal Laboratory Consortium (FLC) in the planning and definition of a National Technology Transfer Center (NTTC),

b. Development of a national conference and exposition for technology transfer which will include broader participation of other federal research and development (R&D) agencies and laboratories,

c. Encouragement to federal laboratories to use NASA's centralized software dissemination center, Computer Software Management and Information Center (COSMIC), which distributes NASA-developed software to industry, and

d. Development of closer linkages between NASA IAC's and various laboratories to serve as useful conduits through which federally sponsored technology developments can flow to U.S. industry.

These efforts have led to closer working relationships between NASA and other federal agencies and laboratories to enhance accessibility of federal technology by U.S. industry. In the months ahead, NASA expects these relationships to grow even stronger, thereby providing industry with effective access to an even broader array of technologies to improve U.S. industrial competitiveness.

In addition to the above, more specific accomplishments within NASA's Technology Utilization Program itself during 1990 included:

a. New technology reporting increased agencywide,

b. Industrial subscribers to ***NASA Tech Briefs*** (***NTB***) reached an all-time high,

c. An international edition of ***NTB's*** approved,

d. Baseline planning and definition of NTTC completed,

e. **TECHNOLOGY 2000**, the first national conference and exposition of NASA's technology for transfer to industry, successfully accomplished,

f. Preliminary planning completed for the restructuring of NASA's nationwide network of IAC's, and

g. Phase I planning and definition of the AdaNET Program completed.

I-2. Technology Access and Information Dissemination

Activities and mechanisms focused on the dissemination of NASA-developed technology to potential users in the public and private sectors of the Nation's economy include: (1) an active effort to ferret out new advancements in science and engineering arising from NASA R&D programs that have potential commercial use; (2) an extensive publications program designed to alert potential users of such advances; (3) computerized access to scientific and engineering reports; and, (4) the development of direct linkages between users and creators of advanced technology--leading to tangible private investment in opportunities for commercial application. A summary of such activities for the period 1990-1991 are as follows:

1. New Technology Acquisition and Evaluation. During the past year, particular emphasis has been placed on improvements in the survey and review of NASA R&D programs and projects, conducted at the NASA field installations, to identify new technological advancements that have potential commercial or secondary use. These efforts were materially enhanced at each NASA field installation through newsletter announcements, technical division representatives, field installation-specific awards and recognition, and employee orientation programs.

On a quantitative basis, the number of new technology reports received overall has increased in the past 3 years, with in-house reporting markedly increasing (from 604 in 1988 to 1,125 in 1990) as compared to contractor reporting which decreased over the same period (729 in 1988 to 475 in 1990). As new tracking procedures are honed further, it is expected that the volume of new technology reporting, particularly from R&D programs conducted in-house, will reach even higher levels in the year ahead. Regardless of the volume in any given year, approximately 56 percent of the new technology reports received are considered to have potential commercial use or application beyond their original intended purpose. It is not expected that this ratio will change appreciably in the future, based on past experience.

2. Technology Transfer Publications. The primary announcement mechanism for new technologies available for secondary use is ***NTB's***, a monthly periodical. Since the commercialization of this popular technical journal in 1985, the

number of subscribers has risen dramatically from 75,000 in 1985 to an all-time high of over 205,000 in 1990. An analysis of pass-along readership of NTB has indicated an average of five readers of each copy of the publication--or over 1 million readers of each monthly edition. During this past year, NASA renewed its cooperative agreement with Associated Business Publications, Inc., to continue *NTB* publication and distribution for an additional 5-year period.

Industrial inquiries for additional technical information generated by the *NTB* magazine topped 120,000 during 1990, a 20 percent increase over the preceding year. A concomitant increase in telephone contacts between industrial users and NASA research scientists and engineers was also experienced this past year.

3. National Technology Transfer Center (NTTC). NASA commenced a major undertaking in 1990 in response to a congressional directive to establish NTTC at Wheeling Jesuit College (WJC) in Wheeling, West Virginia. On March 1, 1990, NASA entered into a program planning grant with WJC as an initial phase of program development. The baseline program definition activities were completed last year along with the development of an implementation plan to commence this calendar year. Given that NTTC is to become a "national" center, it must rely upon the direct involvement and participation by many organizations from across the Nation, including other federal agencies and laboratories, existing technology transfer organizations (such as the NASA IAC's), State and local economic development agencies, as well as appropriate industrial associations and/or professional societies. Both NASA and WJC have involved participants from such organizations in the program definition and planning efforts, and have incorporated specific elements into the long-range NTTC implementation plan. Current efforts are devoted to completing the plan leading to NASA/WJC Cooperative Agreement for program implementation in May 1991.

NTTC is expected to serve as a national focal point for accessing federal technology transfer resources and networks, and as a catalyst and leader in accelerating and expanding U.S. industrial utilization of federal technologies. The NTTC focus on improving technology access is directed toward the use and enhancement of existing technology transfer resources nationwide and the active stimulation through national outreach activities of U.S. private sector awareness of and demand for available federal technologies.

In 1991, WJC will commence a regional demonstration program in the mid-Atlantic states to test specific products and services designed to carry out the NTTC mission. It is anticipated that these efforts will enable NTTC to expand its efforts more readily to other regions of the Nation, once the planned demonstration effort has been completed. Fully operational capability of NTTC is expected in late 1995.

4. Nationwide Technology Transfer Network. With the emergence of NTTC and the broader involvement of all federal agencies and laboratories in technology transfer, NASA is planning a realignment and restructuring of its nationwide IAC Program during 1991. While NTTC will materially aid in promoting

awareness of technology transfer resources for industry, the nationwide system will continue to rely on the technology transfer delivery capabilities of organizations such as the NASA IAC's. Accordingly, NASA intends to realign its IAC Program along regional lines, thereby stimulating more direct technology transfer services for industries located in those regions. Additionally, to further enhance linkages with federal laboratories, NASA has elected to establish the new IAC's responsibilities in regions consonant with the six regional boundaries currently established by FLC--in the northeast, mid-Atlantic, southeast, midwest, mid-continent, and far west.

NASA believes that such realignments will foster greater participation, not only of the federal laboratories but of State-sponsored economic and technical assistance centers, in furthering the efficient and effective access to and transfer of available technology to industry. Moreover, closer linkages with technological resources (e.g., federal laboratories) within a specified region should bode well for increased activity and direct communication with industry.

During 1991, NASA will establish the new regional IAC's through a competitive solicitation. The solicitation will be directed toward universities and nonprofit organizations from the six specified regions to commence operations in January 1992.

5. Computer Software Management and Information Center (COSMIC). COSMIC, located at the University of Georgia, continued its active efforts to encourage industrial users to access and adapt NASA-developed computer software to commercial enterprise during this past year. Of special importance was the First Annual User Group Conference for the C Language Integrated Production System for industry, co-sponsored by COSMIC and the NASA Lyndon B. Johnson Space Center (JSC), Houston, Texas. This conference was quite successful, and added to COSMIC's support and promotion of NASA-developed programs through user group meetings. In 1991, COSMIC will sponsor the 19th Annual NASTRAN Users' Colloquium in Williamsburg, Virginia.

Plans for next year include the development of an on-line capability at COSMIC which will enable COSMIC to greatly enhance its software delivery capacity and provide a more streamlined system for communication and software ordering processes. Such efforts will hopefully create a broader and faster capability at COSMIC for handling microsoftware products being developed more frequently today by NASA and its contractors.

6. AdaNET Program Development. The AdaNET Program is designed to transfer existing and emerging Ada software and software engineering technology from the Federal Government to the private sector through information-sharing, repository, and referral services and networks. During 1990, Phase I of the AdaNET Program was completed and Phase II began. Phase I consisted of the development of a prototype software engineering computer network and information system known as AdaNET Service Version 2 (ASV2); operation and analysis of ASV2 with a national community of users; and the acquisition and cataloging of ASV2 with information from public software engineering components from the Army, NASA, and other government and commercial sources. During Phase I, technical and management capabilities were strengthened

through industry team-building, software engineering market research and analysis, and related technology transfer activities.

AdaNET Phase II is directed toward the operation and deployment of AdaNET services to increase the availability of reusable software components and associated software engineering technology, as well as research and technology to enhance operational systems. During Phase II, AdaNET should be able to demonstrate a tangible return on investment for NASA through cases of software engineering and reuse and technology transfer, and should be able to enter into revenue producing service relationships with external organizations. To understand the requirements of the user communities, AdaNET continues to survey and analyze its consumers and engage the professional and academic organizations through conferences and appropriate forums. During Phase II, AdaNET will form a steering committee comprised of industry, academic, and government representatives.

7. Conferences, Seminars, and Trade Shows. As part of its continuing efforts to broaden awareness and access to NASA-developed technology throughout industry, various elements of NASA's Technology Utilization Program participated in industrial trade shows, conferences, and seminars during this past year. Among the industrial gatherings last year of special importance to NASA was the Design Engineering Show held at McCormack Place in Chicago, Illinois, which attracted over 40,000 participants from virtually every industrial sector. Such opportunities to exhibit and meet with industrial representatives offer NASA an exceptionally fruitful way to encourage industry to seek out new advances in science and technology developed by NASA and other agencies for possible application and use in their firms.

On November 27-28, 1990, NASA held its first national conference and exhibition highlighting transferrable technologies for industry. **Technology 2000**, held at the Washington Hilton Hotel, Washington, DC, was sponsored by NASA, ***NTB's*** magazine, and the Technology Utilization Foundation, a nonprofit organization committed to technology transfer. **Technology 2000**, keynoted by Dr. D. Allan Bromley, the President's Science Advisor, attracted 2,500 attendees--75 percent from industry. Over 90 technical papers were presented by NASA scientists and engineers describing new technological advancements having commercial potential, and several papers were presented which focused on future NASA R&D missions, highlighting possible emerging technologies that may be available for industrial use in the decade ahead. Additionally, over 160 companies, universities, and government agencies were represented in the exhibit hall. In terms of program content, quantity and quality of technical papers and exhibits, attendance, media coverage, and attendee/exhibitor satisfaction, the conference was a resounding success and should become the benchmark against which all future efforts will be measured.

Planning for **Technology 2001** is already underway. This year's technology transfer conference and exhibition will be held on December 3-5, 1991, in the San Jose Convention Center, San Jose, California. This year, NASA is planning to broaden participation to other federal agencies and laboratories by inviting technical papers in five major fields of interest: Advanced Materials, Computers and Software Engineering, Advanced Manufacturing, Electronics, and Biotechnology and Life Sciences. It is expected that

Technology 2001 will attract over 5,000 industrial executives and, if successful, may serve as a national forum for governmentwide technology transfer.

I-3. Technology Applications

The NASA Technology Utilization Program supports a variety of applications engineering projects each year focused on the solution of public sector problems of national scope and significance. These projects are the result of joint efforts between NASA and other federal agencies to identify candidate problems that can be addressed using existing aerospace technology. Generally, there are approximately 60 active applications projects ongoing throughout the year.

During 1990, a number of projects reached significant milestones leading to specific adaptation and use in the public and private sectors of the economy. Highlights of these efforts last year are exemplified in the following cases:

a. Wanderer Notifications Device. The project to develop a Wanderer Notifications Device for the management of wandering behavior in Alzheimer patients was completed. In November 1990, the manufacturer, Cortrex Electronics, demonstrated the device to the Interagency Group that collaborated with NASA to develop the device for home and institutional use. The interagency group consisted of the Administration on Aging, Department of Veterans Affairs, National Institute on Aging, and the National Institute on Disability and Rehabilitation Research. Cortrex plans to initiate manufacturing and marketing for the system in early 1991.

b. Intelligent Reading Training System for Adult Literacy. Advanced software based on artificial intelligence technology developed at NASA's JSC has been demonstrated as having applicability to literacy training for adults. The Houston Read Commission, Houston, Texas, has shown special interest in soliciting funding from foundations to further this concept. Additionally, the National Institute of Corrections and State corrections organizations have shown considerable interest in the concept for literacy training for prison inmates.

c. Intelligent Tutoring System for High School Physics. In 1990, JSC signed a Memorandum of Understanding with Knowledge Revolution, San Francisco, California, to produce a commercial version of the Intelligent Tutoring System for High School Physics developed by JSC as a technology applications project.

d. Diamond-Like Coatings. A Space Act Agreement was signed with Air Products and Chemicals, Inc., to apply diamond-like coatings for corrective lenses. The diamond-like coatings were developed at the NASA Lewis Research Center, Cleveland, Ohio, as part of their materials R&D activities.

e. Noninvasive Burn-Depth Analysis Instrument. Surgeons have stated the need for improved methods to accurately determine the depth of tissue which must be removed to promote more rapid healing and minimize possible infection of human burns. Scientists at NASA's Langley Research Center (LaRC), Hampton, Virginia, developed a high-frequency ultrasound instrument which can detect the interface between viable and nonviable tissue in the burn site. This past year, the marketing of a commercial version of the LaRC prototype was initiated by Westminster FDI, Inc., of North Carolina.

During 1990, NASA continued its cooperation with a number of organizations to identify significant problems in which NASA-developed technology may find application. The following are examples of projects which may be undertaken in the future:

- Advanced Image Processing Techniques to Enhance Magnetic Resonance Imaging for Early Cancer Detection
- Multichannel Flow Cytometry
- Monoclonal Antibodies for Cancer Diagnosis
- Long-Duration Airpack for Firefighters
- Encapsulated Cells for Hormone Deficiencies
- Die-Casting Applications
- Development of a Plasma and Neutral Beam Source for Semiconductor Processing
- Improved Suspension for Wheelchairs
- Improved Environmental Control for Closed-System Growth Chambers
- System to Detect Contraband
- Advanced Ignition Technology for Environmental Protection Agency Methanol-Fueled Engine

These and other applications engineering projects are being considered for possible future funding based on specific evaluation and selection criteria, and participation of user agencies which have identified such needs.

SECTION II

SECURING AND MANAGING INTELLECTUAL PROPERTY RIGHTS

II-1. Inventions, Patents, and Royalties

1. Summary of Activities for the Preceding Year. The overall results of NASA's patent filing activities, and its licensing and royalty-sharing activities, for FY 1990 are as follows:

PATENT ACQUISITION

	NASA Employees	Contractors
-- Invention Disclosures Received:	264	838
-- Patent Applications Filed:	77	104
-- Patents Issued:	86	61

LICENSING AND ROYALTY-SHARING

-- Licenses Granted:	5
-- Royalties Received:	106,000
-- Royalties Distributed to Employees:	75,000
-- Employees Receiving Royalties:	35
-- Royalties Distributed to Field Installations:	20,000
-- Royalties to be Returned to Treasury:	11,000

More detailed statistics regarding these results, including laboratory-by-laboratory break-downs for FY 1981 through FY 1990, are provided in Appendix A.

The filing rate of patent applications increased approximately 20 percent over the filing rate of the preceding year, while the number of invention disclosures received declined slightly. This increased filing rate was achieved primarily because funds were obtained for contracting for services outside of NASA for the preparation of patent applications (primarily at LaRC, Hampton, Virginia). As indicated in the last annual report, in-house resources available for patent filings are close to the saturation point. In addition, the demands on in-house resources to appropriately manage and enforce patent rights once secured are increasing. Consequently, efforts are continuing to obtain the funds and resources necessary for acquiring and maintaining patents on NASA inventions. However, because of the nearly 70 percent increase in patent office fees (in the "Omnibus Budget Reconciliation Act of 1990"), significant readjustment in NASA's patent filing activities may have to be made during the upcoming year. This readjustment will include a reassessment of the patent filing criteria, with the possible result that there may be fewer patent filings. Also, a critical look will be made during the upcoming year at continuing maintenance fees on issued patents, but the result may be that some future licensing opportunities will have to be foregone.

While evaluations are now underway as to how to deal with these unanticipated fee expenses, the total impact on the rate of patent filings will not be known until well into the upcoming year in that trade-offs will have to be made between initial filing and prosecution fees and continuing maintenance fees. However, unless the short-fall can somehow be made up, there may be a reduction in patent filings during the upcoming year.

One organizational change made during the past year that may help the resource limitations was to permit direct patent filing by the field installations. Coupled with this, the field installations will provide sufficient reports of their planned filing activities so that the quality of NASA patents is maintained and Agencywide statistics kept for budgeting and planning purposes. In addition, Headquarters resources will be made available to assist the field installations in the patent prosecution process in the United States Patent and Trademark Office.

The main purpose of the foregoing organizational change was to provide greater field installation integration of patent filing decisions with the licensing and royalty-sharing process as early as possible for the most promising inventions. This latter process, in turn, will undergo continuing evolution during the upcoming year to more directly involve inventors and field installation program managers in an integrated patent filing, licensing, and royalty-sharing program.

Because of resource limitations, selectivity in obtaining and licensing patents is being emphasized. As indicated in the last report, NASA's licensing philosophy is to selectively pursue substantial, business-like licensing opportunities rather than to grant pro-forma or boilerplate licenses, which tend to be nonexclusive and less conducive to commercial investment. The results of this approach are reflected in the licensing statistics, which show that while the number of licenses granted remain relatively constant, both the royalties received (indicative of actual commercial value and use) and the royalties shared with NASA employees (an incentive to support technology transfer) is on a steady increase.

The foregoing matters were specific topics of discussion at NASA's annual Counsel's Conference during the preceding year, and will be discussed again during the forthcoming year. One area of emphasis will be a "client education" presentation directed to invention reporting, patent prosecution, and licensing. Also, within the parameters of available resources, the Director of Licensing has attended several meetings at the field installations with prospective licensees, field installation Patent Counsel, inventors, and other field installation management officials to develop coordinated and integrated licensing plans for identified patents or groups of patents in particular fields of technology. Whenever practicable and appropriate, the possibility of entering into a supporting technical assistance or technical exchange agreement is also explored for some licensing opportunities. This approach will continue to be pursued during the upcoming year.

With respect to managing and protecting intellectual property rights once secured, and as indicated in the last annual report, NASA has been pursuing a vigorous reexamination process to assure the validity of a patent prior to bringing an action against an alleged unlicensed (infringing) user of that patent, which has been exclusively licensed to, and successfully commercialized by, another. Actions of this type must be pursued in order to maintain the credibility of the government's patent licensing program. The reexamination process was brought to a successful conclusion during the preceding year, and a final decision to institute a patent infringement suit will be made, in coordination with the Department of Justice, during the upcoming year.

Also, as indicated in the last annual report, NASA was involved in "priority" of invention litigation (in U.S. District Court) with respect to a patent which dominated a NASA held patent for which there is licensing potential (and an interested licensee). During the discovery phase of the litigation, certain "prior art" was discovered which would seem to invalidate the dominant patent, thus freeing NASA to actively pursue the licensing of it's patent. A motion to remand the matter to the United States Patent and Trademark Office to reconsider the validity of the dominant patent was granted during the preceding year, and it is expected that this matter will be resolved during the upcoming year.

As the result of another action initiated during the preceding year, agreement was reached with the publisher of the ***NASA Tech Briefs Journal*** to include periodic articles on patents and licensing. Material was provided for an initial article which will be included in an issue of ***NASA Tech Briefs Journal*** early in the upcoming year, and plans are being developed to include follow-up articles in subsequent issues.

II-2. Copyright, Trade Secrets, and Related Matters

As indicated in the report for the preceding year, as a general rule, the securing of other basic types of intellectual property rights protection (i.e., copyright and trade secret-type protection) for laboratory innovations is not a viable option under the present status of the law. This is because 17 U.S.C. 105 prohibits works (including computer software) created by federal employees from being copyrighted, and because federal laboratories cannot (other than under a limited exception not useful for NASA) withhold from release under the Freedom of Information Act detailed technical data relating to their innovations that would otherwise qualify for trade secret-type protection.

These legal impediments notwithstanding, NASA did review its present intellectual property rights infrastructure with the objective of assessing the necessary policies and procedures for securing copyright protection, licensing, and even the sharing of royalties, should there be legislative changes with respect to the copyright of computer software created by federal employees. This included a preliminary outline of the procedures for registering and maintaining a docket for copyrighted software, and the subsequent licensing thereof. The conclusion reached was that the obtaining of copyright protection, and the subsequent licensing, of computer software developed by NASA employees could readily be integrated into NASA's intellectual property rights infrastructure should the law be changed in this area, subject only to the availability of resources for doing so. This could be done selectively and in a manner consistent with, and supportive of, the activities of COSMIC in its distribution of NASA's "public domain" computer software.

NASA also testified before the House of Representatives' Subcommittee on Science, Space, and Technology on the desirability and effect of securing copyright protection, and the subsequent licensing, for computer software created by federal employees. The conclusion, again, was that new authority of the type described would provide yet another option which, if exercised selectively and with flexibility, could supplement and reinforce NASA's multifaceted technology transfer activities.

In addition, the authority provided in Section 12 of the Stevenson-Wydler Act of 1980 (as amended) to enable agencies to withhold from release (for up to 5 years) certain technical data developed by their laboratories under a cooperative research and development agreement was assessed during the preceding year in relation to NASA's technology transfer activities. The conclusion was that since NASA enters into its cooperative research and development agreements directly under the Space Act (as provided in 42 U.S.C. 203(c)(5) and (6)) rather than under the Stevenson-Wydler Act, the withholding authority in the Stevenson-Wydler Act would not be useful to NASA. Consequently, as part of its legislation program relating to technology transfer for the upcoming year, NASA has proposed, in its FY 1992 Authorization Act, an amendment to the Space Act to provide the same authority to withhold technical data generated in its laboratories in support of its cooperative research and development agreements that is now available for identical agreements entered into under the Stevenson-Wydler Act. As one related matter, during the preceding year, NASA worked very closely with other agencies, the private sector, and various congressional committees to obtain the enactment of Public Law 101-580 (the Patents in Space Act). This law amended Title 35 of the United States Code to assure the applicability of U.S. patent laws to activities in outer space. The certainty this law provides is important to all commercial ventures undertaken in outer space, including the commercial use of any patented inventions licensed by NASA.

Finally, as a second related matter, NASA has been extensively involved in interagency activities during the preceding year, and will continue to do so during the upcoming year, to develop uniform, government-wide regulations to afford contractors exclusive commercial rights to technical data and computer software generated under federally funded contracts. This is to implement the requirements of Section 1.(b)(6) of Executive Order 12591, and is in furtherance of initiatives to provide greater exclusivity to contractors as an incentive for commercial use of the results of federally funded technology. The first draft of such regulations were published as an advance notice of proposed rulemaking in the ***Federal Register*** on October 15, 1990. Six public hearings were held, and NASA was an active participant in all of them.

While NASA supports such initiatives, some of the technical data and computer software involved may be coextensive with the technology transfer and utilization activities discussed in Section I of this report. This technical data and computer software, in turn, may be that which NASA normally obtains as the result of the reporting requirements of Section 305(b) of the Space

Act, and is transferred in response to NASA's dissemination responsibilities set forth in Section 203(a)(3) of the Space Act. Thus, a very careful balancing of the criteria and guidelines as to when the transfer and utilization process for NASA-funded technology should be carried out by NASA as described in Section I of this report, and when such process should be carried and by the contractor under the exclusivity provided pursuant to Section 1.(b)(6) of Executive Order 12591, is needed in order to prevent conflicts in achieving the coextensive technology transfer objectives of the Space Act and the Stevenson-Wydler Act.

APPENDIX A

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OFFICE OF THE GENERAL COUNSEL

STATISTICS
OF THE
NASA PATENT PROGRAM
(FISCAL YEARS 1981 THROUGH 1990)

Page	Contents
SUMS	Summary Statement on Statistics FY 1990
DEF	Definition of Acronyms and Other Abbreviations
IDY	Invention Disclosures Reported by Year
IDFI	Invention Disclosures Reported by Year and Field Installation
PAS	Summary of Patent Applications Filed in U.S. by Fiscal Year
PAFI	U.S. Patent Application Filed by NASA by Year and Field Installation
PAFF	Patent Application Filed Foreign for FY 1990
PTI	Patents Issued in the U.S. by Year
SOI	Status of Inventions
WAS	Waiver Statistics for FY 1990
SES	Small Entity Report Summary by Fiscal Year
LIC	Patent Licenses by Fiscal Year

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OFFICE OF THE GENERAL COUNSEL
SUMMARY STATEMENT ON STATISTICS

Purpose--The NASA patent program is designed (1) to establish and protect the Government's rights in new technology generated in NASA programs, and (2) to further NASA's mission by using the incentives inherent in the patent system for fostering creation, identification, dissemination and utilization of this new technology.

Policy--NASA's policy with respect to inventions made under contracts, grants and cooperative agreements (with other than small business firms and nonprofit organizations) is based on Section 305 of the National Aeronautics and Space Act of 1958, as amended (42 U.S.C. 2457); and, Public Law 96-517 (35 U.S.C. 200 et seq.) for contracts with small business firms and nonprofit organizations.

Section 305 of the Space Act is unique to NASA in that NASA acquires title to all inventions made under its contracts with other than small business firms and nonprofit organizations unless the Administrator determines that the public interest would be served by waiving title to the contractor. The Statements of Government Patent Policy issued on August 23, 1971, and February 18, 1983, are used as guides in applying this waiver authority. The Patent Waiver Regulations are found at 14 CFR 1245.1 and the Federal Register of November 16, 1987, pages 43748 to 43753.

The disposition of rights to inventions made under contracts with small firms and nonprofit organizations is governed by Public Law 96-517, effective July 1, 1981. This law allows the contractor, who meets the definition of a small business or nonprofit organization the first option to retain title to inventions made under contract, provided such contractor follows the procedures prescribed in the law.

Rights to NASA employee inventions are allocated in accordance with Presidential Executive Order 10096, issued in 1950, and 37 CFR Part 501 of November 1, 1988, which has Government-wide application.

The NASA statistics for the operation of the Jet Propulsion Laboratory by the California Institute of Technology are included in the overall small entity numbers, but also separately shown. To not include the numbers for CIT/JPL as separate statistics could be misleading due to the large number of inventions reported from this one contractor.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OFFICE OF THE GENERAL COUNSEL

DEFINITION OF ACRONYMS AND OTHER ABBREVIATIONS USED IN THESE STATISTICS

FY	Fiscal Year--A period from October 1 of a year to September 30 of the following year.
SE	Small Entity is a nonprofit organization, a college or university or small business. (See definitions of 35 U.S.C. Section 201 and P.L. 96-517).
LE	Large Entity is a firm, corporation, etc., subject to Section 305 of the National Aeronautics and Space Act of 1958, as amended, (42 U.S.C. Section 2457) and not a Small Entity.
GE	Government Employee
CIT/JPL	California Institute of Technology/Jet Propulsion Laboratory
NRO-JPL	NASA Resident Office at the Jet Propulsion Laboratory
IDY	Invention disclosures reported by year
KOR	Means contractor
ARC	The NASA field installation, Ames Research Center at Moffett Field, California
DFRF	Dryden Flight Research Facility at Edwards, California
GSFC	The NASA Field installation, Goddard Space Flight Center at Greenbelt, Maryland
HDQS	NASA Headquarters, Washington, DC
JSC	The NASA field installation, Lyndon B. Johnson Space Center at Houston, Texas
KSC	The NASA field installation, John F. Kennedy Space Center at Kennedy Space Center, Florida
LARC	The NASA field installation, Langley Research Center at Hampton, Virginia

LERC	The NASA field installation, Lewis Research Center at Cleveland, Ohio
MSFC	The NASA field installation, George C. Marshall Space Flight Center at Marshall Space Flight Center, Alabama
EPC	European Patent Convention

Section 305 Space Act--42 U.S.C. Section 2457, Property Rights in Inventions (P.L. 85-568, July 29, 1958)

P.L. 96-517--35 U.S.C. Section 200 et seq., Patent Rights in Inventions Made with Federal Assistance, December 12, 1980.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OFFICE OF GENERAL COUNSEL
INVENTION DISCLOSURES REPORTED BY FISCAL YEAR

FISCAL YEAR	EMPLOYEE[1]	LARGE ENTITY CONTRACTORS[2]	SMALL ENTITY CONTRACTORS		TOTAL
			EXCEPT CIT/JPL[3]	CIT/JPL[4]	
1981	216	954	0	0	1,170
1982	176	760	6	0	942
1983	211	783	20	88	1,102
1984	225	549	43	148	965
1985	192	421	72	177	862
1986	184	447	93	223	947
1987	233	434	83	263	1,013
1988	242	461	115	220	1,038
1989	256	530	154	276	1,216
1990	264	445	131	262	1,102

[1] Inventions subject to 37 CFR 501, E.O. 10096.

[2] Inventions reported and subject to Section 305(a), Space Act of 1958, as amended (42 U.S.C. 2457).

[3] Inventions reported under P.L. 96-517 (35 U.S.C. 200 et seq), except CIT/JPL.

[4] Inventions reported by CIT/JPL under P.L. 96-517.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OFFICE OF GENERAL COUNSEL
INVENTION DISCLOSURES REPORTED BY YEAR AND FIELD INSTALLATION - FISCAL YEAR

Installation		1981*	1982	1983	1984	1985	1986	1987	1988	1989	1990
ARC	GE	29	19	18	57	23	28	26	15	21	6***
	LE	39	37	33	41	41	12	40	53	43	0
	SE	0	0	2	9	5	8	5	5	8	4
DFRF	GE	0	**	**	**	**	**	**	**	**	**
	LE	5									
	SE	0									
GSFC	GE	26	27	25	18	15	19	15	24	16	23
	LE	37	23	23	19	21	21	19	17	13	10
	SE	0	0	0	1	9	12	13	9	13	10
HDQS	GE	1	4	4	0	0	1	0	0	0	0
	LE	7	3	4	2	0	0	0	3	1	0
	SE	0	0	0	1	10	4	1	9	10	0
JSC	GE	18	12	13	10	25	16	22	36	45	51
	LE	287	207	283	137	137	169	87	62	96	106
	SE	0	0	0	4	1	9	17	13	35	23
KSC	GE	4	8	4	9	29	5	10	5	24	28
	LE	25	38	23	9	11	14	12	21	50	20
	SE	0	0	1	2	3	10	4	6	9	0
LARC	GE	58	44	56	52	52	45	100	83	63	53
	LE	48	52	61	45	24	48	50	40	66	45
	SE	0	5	9	10	13	31	21	44	39	60
LERC	GE	47	42	42	36	31	40	37	41	33	38
	LE	48	76	67	42	41	53	22	37	35	67
	SE	0	1	1	3	12	9	3	7	15	5
MSFC	GE	28	21	49	43	17	30	23	38	54	65
	LE	105	64	151	187	140	130	197	228	226	197
	SE	0	0	7	15	19	10	19	22	25	29
NRO-JPL	GE	0	0	0	0	0	0	0	0	0	0
	LE	358	259	138	65	6	0	7	0	0	0
	SE	0	0	88	148	177	223	263	220	276	262
TOTAL		1,170	942	1,102	964	862	947	1,013	1,038	1,216	1,102

* P.L. 96-517 Effective July 1, 1981.
** DFRF included in ARC report.
*** Report being completed.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OFFICE OF GENERAL COUNSEL
SUMMARY OF PATENT APPLICATIONS FILED IN THE U.S. - FISCAL YEAR

	FILED BY NASA						FILED BY CONTRACTOR/ GOV'T HAS LICENSE		
FISCAL YEAR	GOV'T EMPLOYEE	CONTRACTOR EMPLOYE			GOV'T EMPLOYEE/ GOV'T HAS LICENSE	TOTAL	SPACE ACT §305 WAIVER APPLICABLE - LE FILED	P.L. 96-517 APPLICABLE - SE FILED	GRAND TOTAL
		LE	SE OTHER	SE CIT/JPL					
1981*	98	72	0	0	1	171	39	0	210
1982	89	100	0	0	1	190	35	2	227
1983	83	83	0	3	0	169	33	5	207
1984	76	48	5	5	1	135	20	10	168
1985	63	34	12	19	0	128	30	24	182
1986	61**	27	7	18	2	115	39	24	178
1987	69	30	10	24	1	134	28	23	182
1988	85	28	17	43	1	174	31	28	233
1989	80	17	19	34	0	150	16	23	189
1990	77	31	27	46	0	181	08	19	208

* P.L. 96-517 effective July 1, 1981.

** Includes one application converted to a Statutory Invention Registration.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OFFICE OF GENERAL COUNSEL
U.S. PATENT APPLICATIONS FILED BY NASA BY YEAR AND FIELD INSTALLATION - FISCAL YEAR

INSTALLATION	1981*	1982	1983	1984	1985	1986	1987	1988	1989	1990
ARC	9	13	19	18	20	14	7	7	10	4
DFRF	3	**	**	**	**	**	**	**	**	**
GSFC	21	20	15	9	5	7	4	7	12	9
HDQS	0	1	0	0	0	0	0	0	0	0
JSC	16	23	7	13	11	12	21	29	24	26
KSC	1	2	0	2	1	2	1	1	3	2
LARC	28	35	33	30	31	41	55	64	34	49
LERC	32	22	26	22	12	8	7	7	15	19
MSFC	21	26	22	14	17	13	13	16	19	22
NRO-JPL	40	48	47	27	31	18	26	43	45	50
TOTALS	171	190	169	135	128	115	134	174	162	181

* P.L. 96-517 effective July 1, 1981.
** Included in ARC Report.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OFFICE OF GENERAL COUNSEL
FOREIGN PATENT APPLICATIONS FILED IN FISCAL YEAR 1990

CASE NO.	TITLE	NO. OF COUNTRIES DESIGNATED	COUNTRIES
LAR-13,989-1	Real-Time Dynamic Holographic Image Storage Device	4 plus EPO	Canada, Japan, Australia South Korea and EPO.
LAR-13,996-1	Method and Apparatus for Characterizing Reflected Ultrasonic Pulses	6 plus EPO (8)	Canada, Australia, Japan S. Korea, Israel. EPO (Austria, France Germany, Italy, The Netherlands, Sweden Switzerland, and United Kingdom).

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OFFICE OF GENERAL COUNSEL
PATENTS ISSUED IN THE U.S.

	FILED BY NASA					FILED BY CONTRACTOR/ GOV'T HAS LICENSE		
FISCAL YEAR	GOV'T EMPLOYEE	CONTRACTOR EMPLOYEE		GOV'T EMPLOYEE/ GOV'T HAS LICENSE	TOTAL	SPACE ACT $305 WAIVER APPLICABLE - LE FILED	P.L. 96-517 APPLICABLE - SE FILED	GRAND TOTAL
		LE	SE					
1981*	61	88	0	0	149	23	0	172
1982	59	55	0	0	114	22	0	136
1983	80	51	0	1	132	11	0	143
1984	83	60	0	1	144	16	0	160
1985	70	69	0	0	139	23	3	165
1986	64	38	7	1	110	9	5	124
1987	55	36	22	1	114	13	12	139
1988	49	20	28	1	98	14	8	120
1989	55	26	44	1	127	21	28	176
1990	86	17	44	1	148	2	5	155

* P.L. 96-517 Effective July 1, 1981.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OFFICE OF GENERAL COUNSEL
STATUS OF INVENTIONS - FISCAL YEAR 1989

INSTALLATIONS	DISCLOSURES RECEIVED	DISCLOSURES INACTIVATED	DISCLOSURES UNDER EVAL/SEARCH*	AWAITING PREPARATION OF PATENT APPLICATIONS*	APPLICATIONS UNDER PROSECUTION*	PATENTS ISSUED
ARC	20	32	5	3	19	11
DFRF	(Docket maintained at the Ames Research Center.)					
GSFC	43	8	7	36	12	5
HDQS	2	2	0	0	0	0
JSC	180	116	97	23	47	17
KSC	48	50	0	0	3	3
LARC	158	73	256	49	110	47
LERC	110	97	88	23	23	10
MSFC	291	178	5	3	23	17
NMO-JPL	262	186	17	26	0	29
TOTALS	1,114	742	475	163	237	139
					License	1
						140

* As of the end of the Fiscal Year.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OFFICE OF GENERAL COUNSEL
FISCAL YEAR WAIVER STATISTICS

FOR LARGE ENTITY (Section 305 SPACE ACT) CONTRACTORS

I. Petitions for Individual Inventions	1984	1985	1986	1987	1988	1989	1990
1. Petitions for waiver received*	91	75	53	70	55	28	68
a. Domestic			32	41	33	19	37
b. Foreign			21	29	22	09	31
2. Petitions granted**	67	76	49	55	71	28	40
a. Domestic			29	35	42	19	22
b. Foreign			20	20	29	09	18
3. Petitions denied	00	00	00	00	00	00	00
a. Domestic			00	00	00	00	00
b. Foreign			00	00	00	00	00
4. Petitions withdrawn	07	10	06	02	04	02	01
a. Domestic			03	01	04	01	00
b. Foreign			03	01	00	01	01
II. Petitions for Advance Waivers							
1. Petitions for waiver received*	64	55	42	42	48	15	45
a. Domestic			24	22	25	08	23
b. Foreign			18	20	23	07	22
2. Petitions granted	47	48	57	31	50	26	43
a. Domestic			32	16	26	14	22
b. Foreign			25	15	24	12	21
3. Petitions denied	05	00	00	00	00	00	00
a. Domestic			00	00	00	00	00
b. Foreign			00	00	00	00	00
4. Petitions withdrawn	04	06	04	11	02	00	08
a. Domestic			02	06	01	00	04
b. Foreign			02	05	01	00	04

III. Other Statistics

1. Inventions reported by NASA LE contractors (other than SE small business and nonprofit organizations).	445
2. Inventions embodied in patent applications in which NASA has a U.S. license under an individual petition for waiver of title***	5
3. Inventions reported during the year from contracts having advance waiver of title.	3
4. Inventions in which NASA has acquired a license during the year under contracts having advance waiver and in which the contractor has filed a patent application***.	0
5. Applications () Patents () transferred to NASA after filing/issuance.	0
6. Voiding actions****	0

* A petitioner may request domestic rights only, foreign rights only, or both. A petition for both domestic and foreign rights is recorded as two (2) petitions.

** The petitions granted may exceed the petitions received in that the petitions granted are usually for more than one fiscal year.

*** If foreign patent applications were filed as well as a domestic patent application on the same invention, it is recorded as one (1) invention.

**** Voiding actions include the voiding of a waiver of title, either domestic and/or foreign. Entire waivers may be voided or portions of waivers may be voided in foreign waivers wherein the waiver recipient chooses to abandon and/or transfer the rights to less than all the countries.

IN ANALYZING THESE STATISTICS IT IS IMPORTANT TO DISTINGUISH BETWEEN
PETITIONS AND INVENTIONS

PAGE WAS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OFFICE OF GENERAL COUNSEL

SMALL ENTITY REPORT SUMMARY BY FISCAL YEAR
(P.L. 96-517 AND OMB CIRCULAR A-124)

	FY83	FY84	FY85	FY86	FY87	FY88	FY89	FY90
1. Inventions Reported By:								
a. Small Business Firms	004	014	026	026	039	059	089	075
b. Nonprofit Organization	001	005	003	004	008	002	008	006
c. College or University								
(1) Except CIT/JPL	015	024	043	052	036	054	057	050
(2) CIT/JPL	088	148	177	223	263	220	276	262
TOTAL	108	191	249	305	346	335	430	393
2. Number of Inventions SE Elected to Retain Title:								
a. Small Business Firms	002	002	005	009	014	016	029	016
b. Nonprofit Organization	000	000	001	001	001	000	000	000
c. College or University								
(1) Except CIT/JPL	002	008	017	014	013	021	006	006
(2) CIT/JPL	004	013	011	008	035	055	009	009
TOTAL	008	023	034	032	063	090	044	031
3. Patent Applications Filed by Small Entities:								
a. Small Business Firms	002	001	003	006	011	010	009	004
b. Nonprofit Organization	000	000	000	002	001	001	001	000
c. College or University								
(1) Except CIT/JPL	000	006	010	006	009	009	008	005
(2) CIT/JPL	003	003	011	010	002	008	005	010
TOTAL	005	010	024	024	023	028	023	019
4. Patents Issued to Small Entities:								
a. Small Business Firms	000	000	000	000	003	002	006	001
b. Nonprofit Organization	000	000	000	000	001	000	000	000
c. College or University								
(1) Except CIT/JPL	000	000	003	003	003	003	007	001
(2) CIT/JPL	000	000	000	002	005	003	015	003
TOTAL	000	000	003	005	012	008	028	005
5. If Small Entity Did Not Elect Title, How Many Patent Applications Did NASA File on These Inventions?								
a. All Small Entities Except CIT/JPL	000	005	012	007	010	017	007	027
b. CIT/JPL	003	005	019	018	024	043	041	046
TOTAL	003	010	031	025	034	060	048	073

LICENSING STATISTICS

FISCAL YEAR	DOMESTIC EXCLUSIVE	DOMESTIC NONEXCLUSIVE	FOREIGN EXCLUSIVE	FOREIGN NONEXCLUSIVE	TECHNICAL ASSISTANCE
1982	10	24	0	4	0
1983	8	18	0	2	0
1984	10	18	5	2	0
1985	6	5	0	0	0
1986	5	5	2	0	0
1987	8	9	2	0	0
1988	4	3	0	0	1
1989	5	1	0	0	0
1990	4	1	0	0	0

Federal Laboratory Consortium

May 20, 1991

The Honorable Geroge E. Brown, Chairman
Committee on Science, Space and Technology
House of Representatives
2321 RHOB
Washington, DC 20515-6301

Subject: The Federal Laboratory Consortium for Technology Transfer
Annual Report

Dear Mr. Brown:

I presented the Federal Laboratory Consortium for Technology Transfer (FLC) annual report to Congress in a statement on May 3, 1990, to the Science, Research & Technology Subcommittee of the House Committee on Science, Space & Technology. The enclosed report provides additional detail and covers information through FY 1990.

The report concentrates on major initiatives undertaken by the FLC, and we welcome the opportunity to expand on any area. A special focus at the national and regional level continues to be a strengthening of local resources for supporting the hard to reach smaller businesses as well as larger businesses.

A summary is enclosed of "Putting Technology to Work", 1988 and 1990, that provides examples of technology transfer success stories. These documents describe various tools and techniques used by federal laboratories to facilitate technology transfer.

I will be pleased to respond to any questions you may have about the FLC and the services it provides.

Sincerely,

Loren C. Schmid

Dr. Loren Schmid
FLC Chairman

Enclosures

FLC CHAIRMAN **DR. LOREN C. SCHMID**
Pacific Northwest Laboratory • P.O. Box 999 · MS K1-34 • Richland, WA 99352 • (509) 375-2559

FEDERAL LABORATORY CONSORTIUM FOR TECHNOLOGY TRANSFER

SUMMARY

PUTTING TECHNOLOGY TO WORK

1988 Document available from NTIS as PB-88-243357

1990 Document available from NTIS as PB-90-215187
(or available from the Federal Laboratory Consortium)

FEDERAL LABORATORY TECHNOLOGY TRANSFER
PUTTING TECHNOLOGY TO WORK

BACKGROUND:

America's Federal research and development community represents a reservoir of technologies, expertise, and facilities which can be applied for the benefit of our domestic industry. This reservoir is the raw material of the age of technology, requiring cooperative refinement, application and packaging to become a powerful force for economic growth in America and for strengthening this country's competitive position in the world economy. Materials, techniques, formulas, and methods have been developed within Federal laboratories for which commercial uses have yet to be devised. Instrumentation, hardware, software, and process technologies are all part of these Federal resources.

Technology and expertise are available in virtually every area of science and engineering, including:

- Manufacturing technology
- Advanced materials
- Microelectronics
- Environmental protection
- Energy
- Building and construction
- Agriculture
- Transportation
- Ocean science
- Medicine
- Biotechnology
- Communication
- Computers
- Superconductivity

Government agencies and laboratories are striving to insure full value return for the Nation's investment in Federal research and development by offering cooperation and assistance to those who can take advantage of it for expanded use.

America's industry - businesses large and small - is in an enviable position to use this resource of knowledge and technology to enable competitive pursuit of both domestic and foreign markets. This resource can be transformed into new and improved products and services with tremendous potential for America's economy.

THE FEDERAL LABORATORY CONSORTIUM:

The need for more effective use of Federally developed technology led to the establishment in 1974 of the Federal Laboratory Consortium for Technology Transfer. The Stevenson-Wydler Technology Innovation Act of 1980 identified the Consortium as an essential component of the total technology transfer and utilization process. The Federal Technology Transfer Act of 1986 strengthened the Consortium and made it easier for American companies to work with Federal research and development organizations.

This new law encourages Federal laboratories to enter into cooperative agreements with the private sector. It gave laboratories wide flexibility regarding the use of staff, facilities, and equipment, and in intellectual property matters, to encourage increased cooperation and teamwork with private enterprise.

The Consortium is a service organization dedicated to the goal of facilitating technology transfer between the individual laboratory members and the potential users of government developed technologies. The FLC network includes nearly 400 Federal laboratories and research centers representing twelve different agencies. One strength of the network is the ability to put the potential user in contact with a Federal laboratory professional with expertise in his specific area of interest.

TECHNOLOGY TRANSFER MECHANISMS:

A wide variety of technology transfer mechanisms has proven effective. The arrangements for cooperation are made between the company and the laboratory and typically are tailored to the individual situation.

The mechanisms used in cooperating with industry may include the following:

A. Cooperative research projects in which industry and laboratory researchers work together on projects of mutual interest;

B. Workshops, seminars, and briefings put on by laboratory scientists to disseminate information on new or emerging technologies with possible applications to industry;

C. Exclusive or non-exclusive licensing;

D. Sponsored research where industry reimburses the laboratory for work done at the facility;

E. Consulting by technical and scientific laboratory personnel with unique expertise;

F. Employee exchange where researchers from the laboratory and industry trade assignments in areas of mutual interest;

G. Use of laboratory facilities where unique capabilities are present that are not commercially available;

H. Individual visits to laboratories to share information and discuss technical problems;

I. Information dissemination through publications and other printed documentation; and,

J. Membership in Industrial Affiliates organizations associated with the Federal laboratories.

The above mechanisms do not represent an all inclusive list and may also be employed in various combinations as appropriate to the needs of the particular technology being transferred.

PUTTING TECHNOLOGY TO WORK - 1990

LISTING OF TECHNOLOGY TRANSFERS

Following are examples of successful cases of technology transfer. They are meant to illustrate the opportunities available and possible transfer methods. This is only a sample to encouragement potential users to tap the large reservoir of scientific and technical resources present in the Federal laboratories. It is hoped that the uses and benefits described will attract other potential users.

SECTION A: COOPERATIVE RESEARCH PROJECTS

PAGE	TECHNOLOGY	LABORATORY
15	High Strength Copper Composites	DOE - Ames Laboratory
16	The Emissions and Dispersion Modeling System (EDMS)	DOD - AF Engineering Services Laboratory
17	Reliability, Availability, and Maintainability in Computer-Aided Design	DOD - AF Human Resources Laboratory
18	Crew Chief: A Computer Graphics Model of a Maintenance Technician	DOD - AF Human Resources Laboratory
19	Ultrasonic Wall Thickness Measurement System	DOE - Rocky Flats Plant
20	Precision Part Transfer System	DOE - Rocky Flats Plant
21	Cooperative R&D Agreement in Photonics	DOD - AF Rome Air Development Center
22	Human Genome Collaborative R&D Initiative	DOE - Los Alamos National Laboratory
23	Unique Blades Give New Wings to the U.S. Wind Industry	DOE - Solar Energy Research Institute
24	Unique Insulation Attracts Industry Partners	DOE - Solar Energy Research Institute
26	Industry Consortium Develops Unique Wood-to-Phenol Process	DOE - Solar Energy Research Institute
28	Prisons Discover the Space Age	NASA - Jet Propulsion Laboratory
29	End-Use Energy Metering	DOE - Pacific Northwest Laboratory

SECTION B: WORKSHOPS, SEMINARS AND BRIEFINGS

PAGE	TECHNOLOGY	LABORATORY
33	Halogenated Solvent Alternatives	DOE - Rocky Flats Plant
34	Microwave Solidification System	DOE - Rocky Flats Plant
35	Innovative Superconductivity Alliance	DOE - Solar Energy Research Institute
36	Human Systems Divisions Briefing to Industry	DOD - AF Human Systems Division
37	Tech-Link 89	DOE - Los Alamos National Laboratory
38	Structural Collapse Rescue Technologies	DOE - Los Alamos National Laboratory
39	Innovative Concepts Fair	DOE - Pacific Northwest Laboratory

SECTION C: LICENSING

PAGE	TECHNOLOGY	LABORATORY
43	The Ferrous Sulfate/Sodium Sulfide Industrial Wastewater Metals Treatment Process	DOD - AF Engineering and Services Laboratory
44	Commercialization of Thermite Reduction Process Results from Cooperative Effort	DOE - Ames Laboratory
46	Portal Monitor - Extremely Sensitive Radiation Contamination Detector	DOE - Idaho National Engineering Laboratory
47	Common File System	DOE - Los Alamos National Laboratory
48	The Eddy-Current Superconductor Characterization Technique	DOE - Los Alamos National Laboratory
49	Chemiluminescent Technology	DOD - Naval Weapons Center
50	Computer Aided Design	DOD - Army Ballistic Research Laboratory
51	In Situ Vitrification	DOE - Pacific Northwest Laboratory
53	TEMPEST - A Computer Code for Three-Dimensional Transient Hydrothermal Analysis	DOE - Pacific Northwest Laboratory

PAGE	TECHNOLOGY	LABORATORY
54	Converting Fermentable Carbohydrates to Acrylic Esters	DOE - Pacific Northwest Laboratory
55	Antibodies Aid Cancer Treatment	DOE - Lawrence Livermore National Laboratory
56	Instrumentation to be Used in AIDS, Lukemia Research	DOE - Lawrence Livermore National Laboratory

SECTION D: INDUSTRY SPONSORED RESEARCH

PAGE	TECHNOLOGY	LABORATORY
59	High-Speed Inspection	DOE - Pacific Northwest Laboratory
60	The FASTCHEM Technology	DOE - Pacific Northwest Laboratory

SECTION E: TECHNICAL CONSULTATION

PAGE	TECHNOLOGY	LABORATORY
63	SERI and Rentech, Inc. Make Clean-Burning Diesel Fuel From Natural Gas	DOE - Solar Energy Research Institute
64	IRRAS - Integrated IBM PC-Based Probabilistic Risk Assessment Analysis Tool	DOE - Idaho National Engineering Laboratory
65	Glassification Waste Treatment	DOE - Pacific Northwest Laboratory

SECTION F: USE OF LABORATORY FACILITIES

PAGE	TECHNOLOGY	LABORATORY
69	Coating Large Optical Surfaces	DOE - Pacific Northwest Laboratory

SECTION G: INFORMATION DISSEMINATION

PAGE	TECHNOLOGY	LABORATORY
73	Solvent Capacity Test Kit	DOD - AF Engineering and Services Laboratory
74	Simon PC/PS2 4.0-Personal Computer Program	DOE - Idaho National Engineering Laboratory

PAGE	TECHNOLOGY	LABORATORY
75	Environmentally Acceptable Fire Training Facility	DOD - AF Engineering and Services Laboratory
77	Effects of Trace Elements on Weldability of Steels	DOE - Rocky Flats Plant
79	Computerized Selection of Binary Metal Alloys	DOE - Rocky Flats Plant
80	Software Enhancement for Scanning Electron Microscopes	DOE - Rocky Flats Plant
81	Ten Micrometer Size Selective Air Samples	DOE - Rocky Flats Plant
82	EDM Programming with Parametric Equations	DOE - Rocky Flats Plant
83	Automated Storage and Retrieval System	DOE - Rocky Flats Plant
84	Human Cell Acute Toxicity Assay	DOE - Rocky Flats Plant
85	Beryllium Antibody Screening	DOE - Rocky Flats Plant
86	LLNL Code Used to Measure Computational Speed	DOE - Lawrence Livermore National Laboratory

SECTION H: OTHER MECHANISMS

PAGE	TECHNOLOGY	LABORATORY
89	Electro-Optical Vision Produces High-Quality Images During Welding Process	DOE - Idaho National Engineering Laboratory
90	Fermi Industrial Affiliates	DOE - Fermi National Accelerator Laboratory
91	Flow Cytometry Instrumentation: Future Market Changes	DOE - Los Alamos National Laboratory
93	Highly Accurate Casting Process for Metal and Ceramic Matrix Composite Materials	DOD - Strategic Defense Initiative Organization
95	Chemical Vapor Deposition Diamond Coatings for Optics, Electronics and Medical Applications	DOD - Strategic Defense Initiative Organization
96	Magnetic Suspension in Cataract Treatment	DOD - Strategic Defense Initiative Organization

LISTING OF TECHNOLOGY TRANSFER BY INDUSTRIES

To assist the reader in searching for successful transfers in specific areas of interest, the cases are listed by broad industrial classes.

AEROSPACE

PAGE	
15	High Strength Copper Composites
16	The Emissions and Dispersions Modeling System (EDMS)
17	Reliability, Availability, and Maintainability in Computer-Aided Design
18	Crew Chief: A Computer Graphics Model of a Maintenance Technician
34	Microwave Solidification System
36	Human Systems Division Briefing to Industry

AUTO, TRUCKS AND PARTS, AND OTHER TRANSPORTATION EQUIPMENT

75	Environmentally Acceptable Fire Training Facility

CHEMICALS

24	Unique Insulation Attracts Industry Partners
33	Halogenated Solvent Alternatives
49	Chemiluminescent Technology
73	Solvent Capacity Test Kit
54	Converting Fermentable Carbohydrates to Acrylate Esters

ELECTRICAL MACHINERY AND COMMUNICATIONS

44	Commercialization of Thermite Reduction Process Results from Cooperative Effort
21	Cooperative R&D Agreement in Photonics
23	Unique Blades Give New Wings to the U.S. Wind Industry
28	Prisons Discover the Space Age

PAGE	
35	Innovative Superconductivity Alliance
29	End-Use Energy Metering
39	Innovative Concepts Fair
47	Common File System
64	IRRAS - Integrated IBM PC-Based Probabilistic Risk Assessment Analysis Tool

MACHINERY

44	Commercialization of Thermite Reduction Process Results from Cooperative Effort
20	Precision Part Transfer System
38	Structural Collapse Rescue Technologies
82	EDM Programming with Parametric Equations
59	High-Speed Inspection

NONFERROUS METALS

15	High-Strength Copper Composites
79	Computerized Selection of Binary Metal Alloys

PETROLEUM PRODUCTS

26	Industry Consortium Develops Unique Wood-to-Phenol Process
63	SERI and Rentech, Inc. Make Clean-Burning Diesel Fuel from Natural Gas
60	The FASTCHEM Technology

PROFESSIONAL AND SCIENTIFIC INSTRUMENTS

19	Ultrasonic Wall Thickness Measurement System
22	Human Genome Collaborative R&D Initiatives
43	The Ferrous Sulfate/Sodium Sulfide Industrial Wastewater Metals Treatment Process

PAGE

46 Portal Monitor-Extremely Sensitive Radiation Contamination Detector

48 The Eddy-Current Superconductor Characterization Technique

50 Computer-Aided Design

74 Simon PC/PS2 4.0 Personal Computer Program

77 Effects of Trace Elements on Weldability of Steels

80 Software Enhancement for Scanning Electron Microscope

81 Ten Micrometer Size Selective Air Sampler

83 Automated Storage and Retrieval System

84 Human Cell Acute Toxicity Assay

85 Beryllium Antibody Screening Assay

89 Electro-Optical Vision Products High-Quality Images During Welding Process

91 Flow Cytometry Instrumentation: Future Market Changes

53 TEMPEST - A Computer Code for Three-Dimensional Transient Hydrothermal Analysis

95 Chemical Vapor Deposition Diamond Coatings for Optics, Electronics and Medical Applications

93 Highly Accurate Casting Process for Metal and Ceramic Matrix Composite Material

55 Antibodies Aid Cancer Treatment

56 Instrumentation to be Used in AIDS, Lukemia Research

86 LLNL Code Used to Measure Computation Speed

STONE, CLAY AND GLASS

65 Glassification Waste Treatment

51 In Situ Vitrification

69 Coating Large Optical Surfaces

96 Magnetic Suspension in Cataract Treatment

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SECTION A: COOPERATIVE RESEARCH PROJECTS

PAGE	TECHNOLOGY	LABORATORY
17	High Voltage Capacitors Become Industry Standard	DOE-Lawrence Livermore National Laboratory
18	US Auto Industry Uses Solar-Cell Spinoff to Defrost Windshields	DOE-Solar Energy Research Institute
19	Copper Indium Diselenide Promises Cheaper Solar Cells	DOE-Solar Energy Research Institute
20	Glass/Ceramics: Key to Advancing Commercial Glass-to-Metal Seal Technology	DOE-Monsanto Research Corporation - MOUND
21	ECCAD-State of the Art Electrical Circuit Characterization	DOE-Idaho National Engineering Laboratory
22	Ames Laboratory Technology is the Basis for a New Start-up Company	DOE-Ames Laboratory
23	Terfenol-D Technology Transferred Using An Innovative Mechanism	DOE-Ames Laboratory
24	Saving Steel Dollars: Ultrasonic Flaw Detector for Hot Steel	DOC-National Bureau of Standards DOE-Argonne National Laboratory
25	Powder Improves Fatigue Life	DOD-Army Benet Laboratory
26	Aircraft De-Icing Detection Technology	DOT-Federal Aviation Administration Technical Center
27	Clean Coal Demonstration Projects to Commercialize New Processes	DOE-Morgantown Energy Technology Center

PAGE	TECHNOLOGY	LABORATORY
28	Comsat Technology Saves UHF-TV Industry Dollars	NASA-Lewis Research Center
29	Factory of the Future Provides Test-Bed for Industry	DOC-National Bureau of Standards
30	Consortium Brings Agreement on CO_2 Measurement	DOC-National Bureau of Standards
31	Neutrons Used to Measure Micrometer Thick Surface Layers	DOC-National Bureau of Standards
32	High Temperature Superconductivity Device Developments	DOC-National Bureau of Standards
33	Advanced Study Program in High-Temperature Superconductivity Theory	DOE-Los Alamos National Laboratory
34	Flow Cytometry Instrumentation: Future Market Changes	DOE-Los Alamos National Laboratory
35	Laser Angioplasty-Biomedical Company With Product Development Problems	DOE-Los Alamos National Laboratory
36	Biodegradable Plastics from Corn	DOA-Agricultural Research Service
36	Microelectronics and Millimeter Wave Research	DOD-Army Electronics Technology and Devices Laboratory
36	Thin Film Electroluminescent Color Displays	DOD-Army Electronics Technology and Devices Laboratory
37	Loma Linda-Fermilab Project to Build a Proton Accelerator for Medicine	DOE-Fermi National Accelerator Laboratory
38	Compound Separation	NASA-Jet Propulsion Laboratory
39	Genetiscan - Chromosome Karyotyping System, Chromosome Analysis System, and Systems for Cytogenetic Imaging	NASA-Jet Propulsion Laboratory
40	Well Drilling Stress Measurement	DOE-Sandia National Laboratories

PAGE	TECHNOLOGY	LABORATORY
41	Integrated Circuits	DOE-Sandia National Laboratories
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THE FLC

REPORT TO THE CONGRESS
AND
THE FEDERAL AGENCIES
FISCAL YEAR 1990

Activities and Accomplishments of the
Federal Laboratory Consortium for Technology Transfer
Pursuant to the Federal Technology Transfer Act of 1986

December 1990

Report submitted by:

Dr. Loren C. Schmid
Chairman

EXECUTIVE SUMMARY

The Federal Laboratory Consortium for Technology Transfer (FLC) evolved over a period of more than 19 years. The evolution occurred with the help of a series of government initiatives, and culminated in formal chartering by the Federal Technology Transfer Act of 1986. Soon after passage, all Consortium programs identified in the Act were operational and effective. Emphasis then turned to actions that help obtain universal implementation of technology transfer legislation.

We promote the transfer of science and engineering results from federal laboratories into applications in the private and public sectors. The Consortium has no technologies to transfer, but our members do. So, we create an environment that adds value to and supports our member laboratory and department or agency technology transfer efforts. A coordinated program directed at meeting the needs of our members and the needs of their potential partners provides the added value.

Besides creating a technology transfer environment, our programs focus on national initiatives that are beyond the scope of individual laboratories and departments or agencies. A decentralized network of representatives operating as a clearinghouse and an electronic mail system enhances our efforts. The network supported by a clearinghouse locator, matches laboratory expertise and capability to technical needs. The electronic mail provides rapid and effective communication among the representatives.

Although we are not an R&D consortium, the FLC has characteristics that have been identified for successful ones. The Consortium has inspired leaders, unified and well-defined goals, and relatively stable funding. Our focus is on what we can do better as a team than as individual laboratories and agencies. We develop and test transfer methods, address barriers to the process, highlight grass-roots transfer efforts, provide training and emphasize national initiatives where technology transfer has a role.

Major accomplishments include:

- Expanding new initiatives of broad national importance to include advanced superconductivity, drug control, and municipal services,
- Strengthening the six FLC geographical regions to interact more effectively with state economic development programs,
- Improving technology transfer training by focusing on legislative changes and on needs identified by member representatives,
- Increasing our ability for matching technical assistance requests to laboratory capability and expertise,

- Broadening laboratory support to smaller businesses through increased linkages with state technical assistance providers, and
- Identifying some remaining technology transfer issues.

For the most part, legislative and executive actions have laid a strong base for technology transfers. Therefore, the main issues now are at the working level. We categorized them as institutional or process because the barriers involve cultural, behavioral, logistical or financial changes. Issues requiring changes in the culture of the laboratories and their potential partners, will be slow to occur.

Some basic actions could expedite technology transfer significantly and more fully carry out the intent of the legislation. These include establishing requirements for technology transfer in R&D programs, developing economically related goals, and authorizing manpower levels specifically for carrying out the legislation.

Another is to include technology transfer actions and critical rating factors broadly in personnel merit standards and evaluation reports. These actions assist in creating an atmosphere of importance and consistent support to the process as evidenced at the laboratory investigator level.

Many organizations among the laboratories and technology seekers are unaware of the availability and value of federal laboratory technology transfer. The FLC creates an awareness among the technology seekers in the public and private sectors and among the potential providers in the R&D laboratories and centers. We reach out to the seekers, making them aware of potential benefits in using the Consortium to access the federal laboratories. In addition, we are reaching out to members and potential members to make them aware of the benefits of working together as a team.

The FLC is a good forum to help identify and resolve issues and influence universal implementation of technology transfer legislation. Its membership is a diverse set of R&D laboratories and departments or agencies. The laboratory and center FLC representatives are dedicated to helping move technology from the federal R&D system to private and public sector applications. This dedication is directed at improving the global competitive position of the United States.

Reported by:

Loren C. Schmid

Dr. Loren C. Schmid, Chairman
Federal Laboratory Consortium

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NATIONAL INITIATIVES WITH THE PRIVATE AND PUBLIC SECTORS

The Federal Laboratory Consortium (FLC) received its legislative mandate under the Technology Transfer Act of 1986 (PL99-502). Under this mandate the FLC facilitates Federal technology transfer in cooperation with Federal laboratories and the public and private sector. To do this, the FLC initiates national programs that are beyond the scope of individual laboratories or agencies. In most of these initiatives, the Consortium represents the broad resources necessary for substantial progress. Another approach with nationwide impact involves monitoring the success of individual laboratory initiatives and helping in their rapid replication.

INDUSTRY

The larger companies have ample resources and wide interests that result in a broad range of long-term relationships with federal laboratories. The Consortium's strategy for developing this opportunity is to approach individual companies and their trade associations directly at both the executive and technical levels.

The Industrial Research Institute (IRI) and the Federal Laboratory Consortium have been working together to help industry representatives learn about the business potential of laboratory technologies. In 1989 the IRI relaxed its policy of not having exhibits at their national meetings and invited FLC to exhibit at a meeting on the west coast. The IRI liked the approach and it was beneficial to both organizations. As a result, the format included exhibits from the FLC and two or three additional laboratories at each of the 1990 IRI meetings. In addition, FLC representatives participate in the Subcommittee on Federal Technology Utilization of the IRI Federal Science and Technology Committee.

Since 1979, the Consortium has sponsored annual Technology Transfer Workshops in cooperation with a nonprofit organization, Technology Transfer Conferences, Inc. These conferences bring representatives from large businesses in contact with representatives from the laboratories to present new technology transfer opportunities on a person-to-person basis. Attendees at these meetings are management personnel who are responsible for new product acquisition or development in major corporations. Representatives from 45 businesses and 15 federal laboratories participated in the 1989 working session.

In cooperation with the Naval Underwater Systems Center (NUSC), the Consortium is demonstrating a transfer/marketing idea. A retired individual whose background includes service in a federal laboratory and with industry has identified 65 NUSC patents as having commercial potential. The person is an inventor and has licensing experience. The results have been excellent. After interviews with the inventors, the laboratory sent letters about potential applications of the technologies to industrial organizations. The laboratory received five expressions of interest and is in the discussion stage with three responders. The process will be evaluated and key points identified for replication at other laboratories.

A special activity at the FLC Clearinghouse Locator develops a working relationship with and meets the needs of companies that submit multiple requests. The relationship allows the FLC to understand the company's needs and the company to understand the FLC generally and the federal laboratory system specifically.

SMALLER BUSINESSES

The FLC, working with its member laboratories and agencies and through existing state networks, is improving the technical response system available to smaller businesses. The Consortium and its member laboratories have experience and mechanisms for working with small businesses on the local level. We also respond to requests for assistance through the FLC clearinghouse network.

A challenge has been to find ways to work with groups of small businesses and at the national level. In addition, some small businesses do not have a large federal laboratory in their state. Linkages that provide opportunities to serve small businesses through state technical assistance providers have met the challenges in a major way.

The Consortium first tried the approach in 1988 by undertaking a demonstration program with the help of the Oklahoma Department of Vocational and Technical Education (Vo-Tech). The approach has continued with workshops in California, Michigan, Indiana, Alaska, Connecticut and Washington and follow-on workshops in Oklahoma. State organizations are interested in workshops for Oregon, South Dakota, New Mexico, Iowa, Colorado, Idaho, Minnesota, Missouri, Wyoming, Montana, Illinois and Texas. The state technical assistance providers we work with include vocational education groups, community colleges, universities, technical assistance centers, and economic and small business development centers.

We design our workshops to ease factors that prevent small- and medium-sized businesses from taking advantage of the federal technology opportunities available to them. These include a general lack of awareness of existing resources, how to go about obtaining assistance, and insufficient technical staff and time to understand the opportunities. Other factors are a perception that government technology support is complex and can result in more regulation, and intimidating concerns about approaching a large government agency or laboratory.

We have prepared a resource manual describing a technical support system based on our experience. The manual contains material that has proven useful in meeting requests for assistance. It forms the basis for workshops specifically designed to meet a participating state need. The workshops involve presenters from the National Institute of Standards and Technology (NIST) and other member laboratories, NASA's Technology Utilization Program, recipients of federal laboratory technologies, and the FLC. The workshop presenters describe a technical support system for the state in an integrated format.

In a regional demonstration based on the experience of the NASA Stennis Space Center, we are conducting workshops to create informed technology transfer teams in the southeast. The teams draw on personnel from existing county level organizations that reach out to their local industry from within the community. Based on their success the FLC developed a replication plan and provided it to other FLC regions for evaluation. The Department of Agriculture is considering replication of the county approach in selected areas.

A fundamental requirement, for both approaches, is to maximize the use of existing state resources. These resources include extension agents, small business development centers, community colleges, and state and federal laboratories. Our experience shows that over 90% of the technical requests from small businesses can be met by searches of government and commercial databases. The remaining 10% may require access to expertise and capabilities at federal laboratories.

Our workshops show how the small businesses can do those searches at the local level using existing state or federal capabilities. Another part of the workshop provides ways for small businesses to access federal laboratory expertise and capabilities. Guidance is given on the use of FLC and other networks in contacting federal laboratories for technical assistance and other cooperative efforts.

The small business workshops are only one of several mechanisms the Consortium uses to create an environment for technology transfer to occur. A survey by NIST of managers of State and federally-supported programs concluded that 39% of the respondents have used the FLC network. In addition, 63% of the respondents gave it the highest possible rating.

STATE AND LOCAL GOVERNMENT PROGRAMS

State and local governments are responsible for a significant portion of the services provided to citizens, and they have been frequent users of laboratory technology. Often, these agencies have effective programs to help resident companies, to which Federal laboratory technology contributes.

Example FLC programs cited elsewhere in this report include the County Technology Transfer Teams in the Southeast, the small business workshops, municipal services, demonstration projects and the regional demonstrations. The chairman of the FLC Government Subcommittee is a Representative from an Air Force laboratory and is a state employee on assignment to the laboratory.

The FLC has initiated a one-year demonstration with the LOGIN services of William C. Norris Institute. The LOGIN service provides information and electronic mail services to local governments. The FLC allows the LOGIN user group access to the FLC network. In return, FLC has access to the requirements of the local government sector. With this access we can identify priorities of a very sizable user market. It also allows us to explore appropriate support mechanisms and procedures for representatives of local government.

There are 22 agreements between FLC laboratory members and state organizations involving technology transfer initiatives. The FLC has compiled these agreements and plans to use them as references and to develop a model agreement that other laboratories can use as a starting point.

EDUCATION AND TECHNOLOGY TRANSFER

The FLC dedicates itself to promoting technology transfer from federal laboratories to the U.S. public and private sectors. In the public area, the Consortium is developing several models for cooperation with educational entities in their research, training and community service functions. The FLC has begun working with member R&D centers representing the Department of Education to support their training initiatives and to strengthen FLC training efforts. The Oak Ridge Associated Universities (ORAU) supports the Consortium in training activities and they gain from the FLC technology transfer experiences. Those experiences were used in preparing the ORAU testimony on Training Technology Transfer for the U.S. Senate Committee on Small Business. Also, the FLC participates with the National Association of Management and Technical Assistance Centers as they assist small and medium sized businesses in start up and technology commercialization activities.

The universities are expecting a declining enrollment and a declining fraction of those interested in science and mathematics. If this occurs a work force will result that lacks a basic understanding of technology applications. Without this basic understanding, it will be difficult for the public and private sector to use effectively the federal technologies in the future. Manufacturers have identified a better understanding of science and mathematics among their operators as a current need for applying new technologies in their industry. The FLC uses the experience of laboratories who are already supporting local education efforts to encourage and support other member laboratories in stimulating interest in science and mathematics among the K-12 students in their area.

The FLC supports the Iaccoca Institute and FLC member laboratories in establishing a National Education and Training (NEAT) Institute. The Iaccoca Institute promotes the competitiveness of U.S. industry and is part of Lehigh University. The Air Force Human Systems Division and local schools in San Antonio expect to cooperate in the Institute's first effort. The FLC helps by linking member laboratories and the Institute.

NEW CHALLENGES

With its emphasis at the national level, the Consortium provides an effective interagency platform for member laboratories to address initiatives of broad national importance. The emphasis is on supporting national needs in areas where the R&D laboratories and centers can operate more effectively as a team than as individual laboratories. Last year, we identified the Omnibus Trade and Competitiveness Act and the Anti-Drug Abuse Act as providing new opportunities.

Current opportunities for new challenges are in areas that include Advanced Superconductivity, Drug Control, Municipal Services, and the Omnibus Trade and Competitiveness Act.

Advanced Superconductivity: The National Action Plan for Superconductivity recommends an assignment to the FLC. The assignment is to enhance collaboration and cooperation among U.S. organizations performing government-sponsored advanced superconductivity R&D. The Consortium has designated an individual to work with the Office of Science and Technology, the Committee on Materials working group, and representatives from the R&D organizations to carry out the recommendation.

Drug Control: Cooperative efforts are evolving with the Science and Technology Committee of the Office of the National Drug Control Policy (ONDCP). Committee members include representatives from law enforcement agencies and the Department of Defense. They define requirements and select applicable technologies to combat drug use. The FLC will continue to identify laboratories with technologies that match their requirements. The Consortium has designated an individual to work with the ONDCP.

Municipal Services: Under an FLC demonstration project the U.S. Conference of Mayors will be working with city governments and nearby federal laboratories. The purpose is to encourage the use of federal technology in municipal services and facilities and to foster economic development. In addition, the Consortium is discussing future cooperative arrangements with the American Water Works Association Research Foundation. The water supply industry created the Research Foundation as its center for cooperative research and development. Its programs are responsive to the practical, operational needs of local utilities.

Omnibus Trade and Competitiveness Act: Near the end of 1989, Congress approved the National Institute of Standards and Technology (NIST) implementation plan and appropriations for technical extension service activities under this Act. When that occurred, the FLC and NIST signed a cooperative plan for meeting the Boehlert-Rockefeller Technology Extension Program responsibilities of NIST. The FLC support includes preparing training manuals, providing trainers, and participating in state technology extension demonstrations. NIST also is supporting FLC small business initiatives by providing workshop presenters. Other support included participation in the proposal evaluations for the Technology Extension Program.

STRENGTHENING TECHNOLOGY TRANSFER AS A NATIONAL RESOURCE

Technology transfer evokes a variety of challenges to achieve what is in effect, a cultural revolution. The government sector expects to cooperate with diverse institutions and individuals. The agencies and laboratories need to provide technical expertise and initiate and negotiate challenging contractual and financial issues, and to do so rapidly. The private and public sectors need to think of federal laboratories as repositories of available expertise and capabilities. One primary responsibility of the Consortium is to develop the infrastructure and national interest for cooperation between the Federal laboratories and the public and private sectors.

REGIONAL EMPHASIS

The Consortium's six geographic regions are the backbone of its national networking. The Regional Coordinator for each region has obtained advisors from the user communities, as required by the Federal Technology Transfer Act of 1986. Appendix III identifies these regional advisors. Direct financial support to regional programs began in 1988. Each region has made major strides in strengthening cooperation among the Federal laboratories and with business and governments in the regions.

Northeast: This Region developed a directory highlighting laboratory technology transfer and state economic development programs and held a Connecticut Small Business Conference. It has done so in cooperation with state economic development programs.

Mid-Atlantic: A laboratory representative advisory group and Regional Advisors provide advice to the Regional Coordinator on strengthening the laboratory infrastructure in the region. The Regional Advisors are from professional societies, universities, industry, and the media. This region has started a demonstration involving a Business Gold Database for the Bell Atlantic Gateway System. It is a pilot project in the Philadelphia area (see the section on Special Organizational Cooperation). A laboratory technology transfer program and desk-top reference directory describes the mission of each laboratory and lists a point of contact in the region. Cooperative relationships are underway with several economic development organizations in the states of the region.

Southeast: The Regional Coordinator and support staff are training County Technology Transfer Teams (see Smaller Businesses Section). Also they are visiting federal laboratories and encouraging them to take leadership roles and to participate in cooperative efforts in the region. Two federal laboratories have signed cooperative agreements with five states in the region. With the assistance of NASA, the FLC has a service center operating in the region that is part of the clearinghouse locator network. The Region using the Office of Technology Transfer at Virginia Polytechnic Institute has collected a set of casebook summaries of federal laboratory spin-off companies.

Mid-West: This Region focuses on long range relationships with state economic networks, cooperation in handling technical business requests, and linkages between the states and federal laboratories. Linkages exist or are in process between state organizations and the federal laboratories in the Region. Some of the laboratories are the Wright Research & Development Center, NASA Lewis Research Center, EPA Risk Reduction Engineering Laboratory, and the National Institute for Occupational Safety and Health.

Mid-Continent: The region completed a survey of federal R&D laboratories and centers in the region. The Regional Coordinator encouraged non-member organizations to participate in Consortium activities and several new members resulted. A major new thrust introduces the FLC small business training workshops in the Region. After learning about our organization, one state is forming a state version of the Federal Laboratory Consortium. The region planned and conducted an innovative national FLC meeting. The Consortium received many excellent comments because of the technology transfer issue format and the quick response to questions made possible by a computer network available to attendees at the meeting.

Far West: This Region with the Mid-Continent Region is cooperating with other organizations in the two regions to develop and demonstrate a western technology transfer network for smaller businesses. One cooperating organization is the Center for the New West. With them, the Region is planning an initiative to decide on the feasibility of using relevant federal and other R&D resources for improving key water resource infrastructure in the west. Another initiative is with the Western Research Applications Center and the Mid-Continent Region to show the value of a technology transfer network for small business (see Special Organization Section).

WASHINGTON, D.C. REPRESENTATIVE

The Washington, D.C. Representative provides FLC coordination, presence and focus for transfer opportunities in the D.C. area. The coordination occurs with federal agencies and the Washington-based representatives of the user community such as trade associations, state and local government officials, and business policy organizations.

The Representative is working with industry associations for small and large businesses as they begin to introduce technology transfer as a major thrust for their member companies. The first stage is the development of a core constituency among association members. The intention is to develop a generic plan for use with many trade associations headquartered in the D.C. area.

Through efforts of the Representative, the FLC is integrated into the community of industry, academia, and government officials. Her emphasis is on those having an active interest in both practical and policy issues related to domestic transfer. The Council of Scientific Society Presidents has for the first time invited the FLC to participate in a national meeting -- a consequence of FLC outreach efforts. The Council is a central organization for contacting the leadership of the scientific community.

She participated with staff of the Office of Science and Technology Policy in planning a meeting of government, foundation, university, industry and FLC people to consider the gap problem. The gap occurs between government funded research and the point at which industry has enough information to decide on investing in further development and commercialization of a technology.

The Representative arranged for the participants, from Congress and the Administration, who identified and commented on technology transfer issues at the Spring 1990 FLC Meeting. She has compiled the issues and prepared them for review by the participants and other interested individuals. The Issues Section includes a summary of the result.

BUILDING LABORATORY INFRASTRUCTURE

The Consortium offers assistance to the laboratories in improving the skills of their technology transfer personnel and in improving their internal support for technology transfer.

Transfer Methods: Through its organized semiannual meetings, the Consortium provides exposure for technology transfer officials to a variety of working cooperation models, with the opportunity for in-depth assistance. Topics in 1989-90 included: New Mid-Atlantic State and Local Initiatives That Aid Commercialization; New Federal Initiatives That Aid Commercialization; Coalitions, Confederations & Consortia; Process of Diffusion; Cooperative Research & Development Agreements; How Industry Gears Up to Acquire

Federal Technology; Non-federal Networks; Local Network Resources; Process-Agency Programs to Transfer Technology; and the Role of Money as a Bridge to the Technology Transfer Process.

Training: Training efforts receive a high priority within the FLC. Because of the efforts, laboratory and agency personnel become more aware of their responsibilities under the Federal Technology Transfer Act and learn ways to carry out those responsibilities.

At each National Meeting, we conduct orientation sessions designed for new FLC Representatives and those with interest in advanced training. We are revising the FLC Representatives Handbook used in the orientation sessions to include checklists for developing internal briefing materials and drafting Cooperative Research and Development Agreements and similar activities. The attendees must arrive a day earlier than for the regular meeting sessions. Even so, the sessions are well attended.

The FLC will continue to meet training needs identified by its members. These include training in cooperative R&D agreements, technology transfer legislation, laboratory technology marketing, FLC electronic mail use and technology transfer office management.

Other training opportunities are available to all National Meeting attendees as part of the meeting sessions using experts outside the FLC. The topics chosen respond to the suggestions made by attendees in evaluations of previous training sessions. Past sessions have included patenting and licensing, marketing, communications, teleconferencing and dealing with the media. Future training will include electronic mail and using broker organizations.

The FLC is carrying out workshops, for state technical assistance providers, that describe a technical support system for small- and medium- sized businesses (see the section on Smaller Businesses). We have written a generic resource manual that we modify for use in a specific state. In some cases the workshops provide training in forming effective requests for technical assistance.

Awards: The FLC rewards successful transfers and encourages pace-setting technology transfer efforts. In 1984, we established a Special Award for Excellence in Technology Transfer that recognizes scientists and engineers, within federal laboratories, for extra efforts in transferring their technology. The Consortium makes the award for uncommon initiative in a recent transfer for which an industry or state and local government receive significant benefit.

To date we have presented 185 awards to 364 individuals from 56 different laboratories and R&D centers representing 10 departments or agencies. Since 1984, the agencies making the winner's circle have increased from five to nine in any given year. Appendix I lists the 1990 and 1989 winners.

The Representative of the Year, Outstanding Service, and Harold Metcalf Awards are other awards started in 1977. The Representative of the Year Award honors a representative to the Consortium who has contributed significantly to Consortium programs during the past year. The Outstanding Service Award recognizes individuals, who are not FLC Representatives, for a notable contribution to the FLC in terms of support and service. The Harold Metcalf Award honors an FLC Representative for significant sustained service to the Consortium and for success in improving the technology transfer process.

NATIONAL COMMUNICATIONS INFRASTRUCTURE

An important national effort by the Consortium is the development of an efficient communications network of laboratory representatives. Electronic mail and information resources support the network. The FLC Information Systems Committee is improving internal communications, information resources, and our capability to respond to inquiries for laboratory expertise and capabilities from the business community. The focus has been on Clearinghouse Locator resources, electronic mail, and audioconferencing.

Laboratory Locator: The FLC Locator primarily helps member laboratory Representatives respond better to outside requests. The requesters are looking for potential laboratory partners for licensing, cooperative R&D agreements, or other cooperative activities. It also provides a significant entry point to the FLC network for those who contact it directly.

The Locator has handled over 1000 requests from 45 states encompassing 35 major technology areas. The small business sector is the top user with 42% of the requests coming from that sector. Percentage use by sector and regions are:

SECTOR		REGION	
Small Business	42%	Far West	22%
Large Industry	38%	Northeast	18%
Federal Government	10%	Mid-Atlantic	17%
Universities	4%	Mid-Continent	17%
State and Local Government	3%	Mid-West	16%
Other	3%	Southeast	10%

The Clearinghouse Locator coverage is nation-wide with California, Texas, Illinois, New York, and Oklahoma being the top five user states. The small business workshops conducted by the FLC are improving the quality and quantity of requests received by the Locator from that sector. Initial user evaluation surveys use a computerized tracking and follow-up system. Overall, 96% of the requests had satisfactory responses.

Electronic Mail: The FLC electronic mail network has more than 100 locations that represent 290 R&D laboratories and centers, Advisors, and FLC initiative participants.

PROMOTING TECHNOLOGY TRANSFER

Many organizations are unaware of the availability and value of federal laboratory technology transfer. Both awareness and interest need to be developed further through an extended effort.

The FLC is using a dual approach in responding to the need to provoke activity and interest in technology transfer. An awareness is created among the technology seekers in the public and private sectors and among the potential laboratory providers. We are giving more attention to making others aware of the role of the Consortium and simultaneously expanding our resources to meet an increased demand for support. For example, the FLC has been reaching out to technology seekers making them aware of potential benefits in using the Consortium to access the federal laboratories. In addition, we are reaching out to members and potential members to make them aware of the benefits of working together as a Consortium.

Executive members of the Consortium have cooperated in presentations, workshops and panels sponsored by other organizations. The sponsors include the Office of Science and Technology Policy, the National Incubator Association, the Office of Personnel Management, the Licensing Executives Society, the National Center for Manufacturing Science, the National Council for Urban Economic Development and the Advisory Commission on Intergovernmental Relations.

The FLC, in its efforts to promote transfers, provides an effective forum for the laboratories to share experiences, solve problems and compare success stories. In 1988, we first published "Putting Technology to Work" that contained examples of successful transfers at member laboratories. We have distributed 1000 copies of the document and referred several hundred other requesters to the National Technical Information Service. The Consortium compiled subjects for a second volume from its member laboratories in

1989 and issued them early in 1990. In total, the two documents describe eight transfer mechanisms using 194 examples from 35 laboratories representing 10 agencies.

FLC publications, articles, exhibits, and panel presentations emphasize the sharing of information to help each other and those persons outside the FLC transfer the technologies of our respective laboratories. These efforts complement the Regional and National Meetings and the more direct efforts of creating a transfer environment through workshops and support to common interest networks. The FLC News, a monthly publication with a circulation of 2000 copies, includes such information and other items of current interest.

Our Marketing and Public Affairs Committee updated the FLC traveling exhibit and displayed it at appropriate locations around the U.S. Each year we displayed the exhibit at about 8 conferences that included the Government Microcircuits Application Conference, American Chemical Society, and Industrial Research Institute. The Committ[illegible]s preparing a topical exhibit that will show federally-developed technologies used in disaster situations. It also is developing a set of presentations related to the role of federal laboratories in business and industry, and is establishing a speakers' bureau.

SPECIAL ORGANIZATIONAL COOPERATION

The FLC Awards Program focuses attention on successful implementation of technology transfer legislation within the government, industry, and the public sector. In 1990, for the first time, we gave advance notice of the technology excellence awards to the U.S. Department and Agency heads. The advance notice encouraged them to add their congratulations to the awardees in their organization by letter. The invitations received a good response.

Nine agencies and departments wrote letters to the awardees. Signatories included the Secretaries of Agriculture, Commerce, Veterans Affairs, Air Force, and Army and the Administrator of NASA for their respective Agencies and Departments. A congratulatory letter to the award recipient and his or her laboratory director is important because it reinforces commitment to domestic technology transfer.

The Secretary of Energy sent a letter to its laboratory directors highlighting the important role the Consortium plays in helping with the transfer process. He commended the directors for their contribution to the outstanding record the Department of Energy has achieved in supporting the FLC and encouraged their continued support.

The FLC stimulated effective use of industrial designers in technology transfer. A representative from the Industrial Designers Society of America (IDSA) was featured as a luncheon speaker for an FLC National meeting. The presentation triggered broad interest in benefits gained through early involvement in the commercialization process. The Department of Commerce, The President's Council on Competitiveness, and interagency groups have expanded the interest. Future plans include presentations at a conference on cooperative R&D and an effort between the IDSA and the FLC Far West Region.

A significant network pilot demonstration is underway that involves creation of a Business Gold database for the Bell Atlantic Gateway System. The demonstration involves the Naval Air Development Center, Strategic Defense Initiative Organization, and Pennsylvania Technical Assistance Program. The gateway system provides sources of new technology, business assistance sources and contract opportunities for U.S businesses and consumers. The Departments of Defense, Energy, Agriculture, and Health and Human Services have provided data. Other agencies and departments are expected to follow.

The Center for the New West and the FLC have signed a Memorandum of Understanding. The agreement describes the scope for mutual technology transfer efforts in the West and involves the interchange of ideas, dissemination of research results, and development of joint projects. The Center focuses on family life, workplace, and global economy changes that affect opportunities for business and communities in the western U.S. Two projects are underway:

(a) The Far West and the Midcontinent regions have joined with the Western Research Applications Center (WESRAC) and the Center for the New West in a demonstration project "The Western Technology Transfer Network for Small Business." Under this project WESRAC, the Consortium and technical resources in the states function as the central resource for technology transfer services. The technical resources include nonprofit and state service organizations dedicated to small business assistance. Fourteen western states are implementing the program.

(b) The Center for the New West and the Bureau of Reclamation are working together on a water resource program. They are looking at the feasibility of using federal and other R&D resources to improve key water-resource infrastructures in the west. They will use cooperative R&D mechanisms in planning and demonstrating the efforts. The

Far West and Midcontinent FLC Regions are identifying laboratories and individuals with programs and expertise in water quality research. With the Center for the New West, they also are identifying needs with limited activity.

An FLC task force is working with NASA staff in planning for the National Technology Transfer Center (NTTC). Efforts are focused on identifying areas where the NTTC can complement the FLC and vice versa.

DEMONSTRATION PROJECTS

Public Law 99-502 specifies that the FLC shall use 5 percent of its funds to carry out demonstration projects in technology transfer. In response to this guidance, the Executive Committee has authorized a series of contracts with non-profit organizations. The primary purpose of the contracts is to support the transfer of technology from the Federal laboratories and/or to advance state and local economic development. The objective is to develop and show innovative - and replicable - techniques for moving new technologies from the laboratories into the private and public sectors.

A consortium of the University of Utah and Brigham Young University received the first contract in 1987. The project had two objectives. One was to develop a tailored inventory of industrial organizations seeking new technologies. The other was to prepare software for expedient drafting of documentation on licensing of laboratory intellectual properties. The industrial inventory includes detailed profiles on over 2000 corporations interested in federal laboratory technologies. It is available for use by member laboratories through the FLC Clearinghouse Locator and the laboratories can purchase it directly or through the FLC. The documentation software package will be available to all FLC laboratories at a reduced cost.

The second contract award was to the U.S. Conference of Mayors. The Conference will be working with local governments in eight cities to show the applicability of local laboratory resources for solving urban problems. It has formed a special advisory group of city mayors to follow the effort. The Conference also will be sponsoring a workshop on support available from the Federal laboratories for local government officials.

Procurement opportunity for a third demonstration project will be announced early in CY 1991. Commitments for the first two projects total approximately $130,000.

FINANCIAL SUMMARY

Table I shows the FY 1990 receipts from FLC member Departments and Agencies as reported by the National Institute of Standards and Technology. The FY 1989 receipts are included for comparison.

TABLE I. FISCAL YEAR RECEIPTS

	RECEIPTS ($1,000)	
DEPARTMENT OR AGENCY	FY 1989	FY 1990
Department of Agriculture	$ 51.0	$ 42.6
Department of the Air Force	123.9	100.0
Department of the Army	160.4	188.3
Department of Commerce	22.4	22.5
Department of Energy	392.0	403.0
Department of Health and Human Services	62.0	68.5
Department of the Interior	27.5	28.1
Department of the Navy	249.6	280.0
Department of Transportation	14.9	14.4
Department of Veterans Affairs	17.0	16.1
National Aeronautics and Space Admin.	100.0	200.0
National Science Foundation	21.7	23.6
RECEIPTS	**$1,242.4**	**$1,387.1**
Navy Support to Specific FLC Efforts	42.0	
TOTAL FUNDS RECEIVED	**$1,284.4**	**$1,387.1**

The funds shown in Table I are important for the administration and operation of the FLC. Another significant resource is the services in-kind and the time spent by representatives from the laboratories, agencies and other organizations in the activities of the Consortium. This human resource would not be available without the funding and other support of their organizations. A measure of that support is provided in Appendix III, Organizational Elements. During 1990, staff from 35 different laboratories related to 10 different agencies or departments and from 55 user organizations participated directly in the operation of the FLC.

Table II reports how the funds were disbursed during FY 1990. In previous years, the expenditures had been reported on a calendar year basis. This year narrative, funding, and expenditure reporting is being done on a fiscal year basis. For continuity in this report, the CY 1989 and quarter expenditures common to CY 1989 (last quarter) and FY 1990 (first quarter) are shown in Appendix II.

TABLE II. FISCAL YEAR 1990 EXPENDITURES

PROGRAM ELEMENT	EXPENDITURES ($1000)
Management and Administration	
Executive Management	$ 70.0
Operations Management	214.3
Washington, DC Representative	137.2
Operations and Member Services	
Meeting support	105.5
Training	46.3
Communications	58.2
Clearinghouse	163.9
Outreach Program	
Outreach Materials & General Support	55.3
Exhibits	11.9
Demonstration Project	55.0 *
Regional Support	196.0
Total FY 1990 Expenditures	**$1,113.6**

* Represents disbursements only. Commitments for the first two demonstration projects total approximately $130,000.

The Consortium appreciates the efforts of the National Institute of Standards and Technology in collecting the payments required by the Technology Transfer Act. We find its willingness to advance funds in anticipation of the receipts particularly helpful. Much of the funding is not received until late in the year so the advances allow continuity.

ISSUES

At the Spring 1990 FLC National Meeting, a forum of representatives from Congress and the Administration discussed some remaining technology transfer issues. As an out growth of that meeting, the FLC has compiled and more clearly defined the issues. We will distribute them to the participants and other interested people. This section provides a brief summary of the issues. A more detailed listing is available on request.

Technology transfer legislation, an executive order, and other pronouncements have laid a strong base for technology transfers from federal laboratories to the private and public sectors. There are a few areas where new legislation would be helpful, such as the controversial copyrighting of software, but for the most part the needed legislation exists. For the remaining issues, those at the policy level must address some institutional and process needs if we are to realize the potential of domestic transfer. Implementation requires a commitment by management and the establishment of effective processes.

For some issues it will be advantageous to have government or agency-wide guidance to simplify procedures, while maintaining a flexibility critical for successful technology transfer. Technology seekers, who deal with more than one laboratory, expect some consistency. Providing guidance requires caution so we do not impede progress that some laboratories have already obtained.

INSTITUTIONAL ISSUES

U.S Business Preference: Legislation states that U.S. corporations and small businesses are to have preference in technology transfers from federal laboratories. Each department, agency, laboratory, or consortium now interprets this language independently. Hearings also considered the definition of U.S. corporations. Information to help implement the preference legislation appropriately would improve the transfer process.

Patenting and Licensing Assistance: Some laboratories have no patent and licensing assistance readily available. In addition, the requirements overload the staff of others or soon will overload them. Evaluating the need for such assistance at the laboratory level could result in an appropriate remedy to meet their requirements.

SBIR Technology: Technology developed by Small Business Innovation Research recipients may remain unpatented because of the lack of small business resources or motivation. Modifications to licensing regulations might ease this problem, promote the commercialization of the innovations and be consistent with the spirit of the FTTA.

Conflict of Interest: Laboratory employee conflict of interest concerns or their appearance may be impeding technology transfer processes. Consistent guidance on matters such as employee consulting, equity positions, and personnel assignments to industry could help reduce the adverse effects.

Consultant Agreements: Not all federal laboratories either have or exercise authority that allows working for the private sector on a reimbursable basis unless it involves a Cooperative Research and Development Agreement (CRDA). General guidance for allowing laboratory staff to work with the private sector could improve the commercialization process. It would simplify and expedite agreements for consulting during the transfer process.

Fairness Judgements: Although laboratories incorporate fairness of opportunity and preference for small businesses in their transfer activities, some small and large businesses may still raise an issue of unfairness. Criteria for being fair to both small and large businesses would strengthen the technology transfer process.

Unpatented Technology: Some federal technologies are not patentable but are commercially important. Guidance regarding disposition of royalties or other income from those technologies would be useful.

Shared Risk/New Approaches: Domestic technology transfer requires new approaches to be successful. But, individuals whose approval is necessary are apt to act conservatively. They perceive their personal risk for failure is greater than the perceived rewards. Mechanisms for sharing risk and rewarding success will encourage new approaches to technology transfer.

Federally Funded Research and Development Centers: Not all Federally Funded Research and Development Centers are sure the definition of laboratory in the FTTA includes them. Clarification of their opportunities under the Act would be helpful.

Education and Training Software: Both the Training Technology Transfer Act of 1988 (TTTA) and the FTTA of 1986 cover the transfer of education and training software. The TTTA appears to centralize the transfer in an Office of Training Technology Transfer (OTTT) within the Department of Education. The FTTA provides decentralized transfer directly from the laboratories. As the OTTT becomes operational, clarification of responsibilities will be timely to guide potential recipients and enhance technology transfer in this important area.

PROCESS ISSUES

Foreign Patent Filing: Patent protection in foreign countries must be considered when filing a patent. It is very important for commercialization of some government technologies. The high cost to the laboratory can be an impediment if it does not file foreign patents selectively, however. There is a need to protect the invention in the major foreign markets to which it applies. Some laboratories could use information to guide them in foreign patent decisions.

Exclusive Licensing: Usually, to obtain the interest of a company in a federal technology an exclusive arrangement is necessary. Information on appropriate exclusivity, licensing announcements, and alternate licensing arrangements that still allow the broadest possible transfer of a technology is important for an effective technology transfer process.

Licensing Announcements: Current federal code requires a notice of intent to grant an exclusive license and to identify the potential licensee. Such a requirement can be incompatible with a company's policy related to its competition. It also may be inconsistent with granting patents or patent assignments in advance under Cooperative Research and Development Agreements (CRDA). Existing regulations should be revisited and appropriate changes made to meet the intent of new and past legislation.

Commercialization Experience: Some potential licensees approach a federal laboratory to license a technology without having in place an organization with proven expertise and capability for commercializing the technology. Information on desirable means for handling such requests would improve the commercialization process.

CRDA Language: Without other language, some CRDA proposals borrow words from the procurement process that is not appropriate. The availability of general language that protects the government's interest and that is consistent with the FTTA intent for CRDAs could hasten those agreements.

Consistent Leadership: Effective technology transfer requires demonstrated interest, direction, and time and funding commitment from management combined with a nurturing of the grass-roots working level. The commitment must occur throughout the department or agency and laboratory management structure. Effective technology transfer needs mechanisms that consistently support the process as evidenced at the laboratory investigator level. Examples include putting technology-transfer actions and critical rating factors in personnel merit standards and evaluation reports. Others are making laboratory professionals aware of their technology transfer responsibilities, rewarding technology transfer successes, and providing funding.

Facilitating Laboratory Access: Current information about available technologies, R&D activities, and expertise compiled for use in helping technology transfer does not represent all laboratories equally. An acceptable means to assure more uniform representation would facilitate the technology transfer process.

Freedom of Information Act Exemption (FOIA): The amendment to the FTTA provides up to a 5-year exemption from FOIA disclosures for technical information developed under all CRDAs. The value of this exemption would be improved and the laboratories could consistently use the provision if information on implementation were available.

Effective Technology Transfer Process: Transfers work best when there is a continuum of cooperation. The continuum should begin at the idea stage and continue through engineering development to an ultimate use by the public or private sector. Involving the U.S. private sector appropriately in the planning, evaluation, and implementation of government R&D programs would ultimately hasten the use of the results. Also, mechanisms for obtaining industry input on issues such as the effectiveness of exemptions from the FOIA, U.S. preference policies and appropriate fairness of opportunity judgements could provide important guidance for future actions.

APPENDIXES

I. AWARDS PROGRAM RECIPIENTS

II. FINANCIAL SUMMARY

III. FY 1990 - ORGANIZATIONAL ELEMENTS

APPENDIX I
1990 AWARDS PROGRAM RECIPIENTS

The FLC NEWS

FEDERAL LABORATORY CONSORTIUM FOR TECHNOLOGY TRANSFER

JUNE 1990 VOL 6 NO 7

TECHNOLOGY TRANSFER ACTIVITIES

LAB PROVIDING HELP IN SEATTLE ARSON CASES

The Lawrence Livermore National Laboratory (LLNL) has been providing technical assistance to Seattle firefighting officials who are trying to solve nine suspected arson fires in Washington state, including three in the Seattle area, since 1984. Two firefighters have died in fighting the blazes.

The fires were so intense that many of the buildings burned to the ground, even though they were steel structures with concrete floors. Damage estimates run more than $16 million.

In an effort to so've the cases, law enforcement and fire officials asked LLNL to help .etermine how the fires were being set and the type of fuels used. LLNL has conducted extensive research into the effects of extremely high temperatures on concrete and other materials.

Responding to the Seattle request for technical assistance, the Laboratory sent Harry Hasegawa, a Hazards Control fire research engineer, and Kirk Staggs, a senior scientific technologist. They went to Seattle to help the city's fire department set up and monitor a fire test that might provide badly needed answers.

As a part of the Laboratory-City of Seattle cooperation, Hasegawa agreed to help local fire investigative specialists and others from several-cooperating agencies conduct a full scale test burn on March 25.

The test used materials similar to those apparently favored by the arsonist. Because all of the buildings

Continued on Page 2

FLC SPECIAL AWARDS PRESENTED

Each year the FLC has three special service awards that it can present to deserving individuals. At the Spring FLC Meeting these awards were given:

The **HAROLD METCALF AWARD** recognizing sustained significant service to the FLC of an individual Rep. to **JAMES WYCKOFF**, NIST, DOC - Retired, for leadership in the formalization of the FLC's programs and financial management, and service on the Executive Committee.

The **REPRESENTATIVE OF THE YEAR AWARD** recognizing the individual FLC Rep. making the most significant contribution to the FLC program during the past year to **ROBERT BARLOW**, NASA - John C. Stennis Space Center; for outstanding regional leadership in special efforts to increase lab participation, the establishment of a Regional Advisory Team and the development of an implementation model for Technology Transfer Teams.

The **OUTSTANDING SERVICE AWARD** recognizing individuals, who are not FLC Reps., for a notable contribution to the FLC of support/service to **KATHY KURKE**, Office of Counsel, U.S. Army - Fort Belvoir; for exemplary efforts in the development of Cooperative Research & Development Agreements and the improvement of related laboratory legal processes.

James Wyckoff (left) receiving The Harold Metcalf Award from 1989 recipient, James Hall. (Photo Left)

Robert Barlow (left) accepts the Representative of The Year Award from H. Dana [redacted]. (Photo Below)

The Outstanding Service Award being presented to Kathy Kurke by 1988 recipient, Del DelaBarre. (Photo Left)

FLC AWARDS PROGRAM RECIPIENTS

The FLC Awards for Excellence in Technology Transfer were established in 1984. The award recognizes the excellence of federal laboratory employees who have exceeded their responsibilities by their outstanding work in transferring technology to other organizations. These award winners are individuals whose activities clearly merit national recognition. The following individuals were honored by the Consortium for 1990:

OAK RIDGE NATIONAL LABORATORY

VICTOR J. TENNERY

For major contributions to industry by conceptualizing, starting and managing the High Temperature Materials Laboratory User Program

ARGONNE NATIONAL LABORATORY

ROBERT P. LARSEN, RAJ SEKAR

For successfully applying the silicon nitride material technology to race car engines, in part by using personal time and funds.

ARGONNE NATIONAL LABORATORY

OSCAR O. OHLSSON

For initiative in commercializing Binder-Enhanced Refuse-Derived Fuel (b-dRDF) Pellets by proposing a Minnesota Legislative Amendment for concurrent operating permit testing, and entitling a private company for joint sponsorship.

NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

HAZARDOUS MATERIALS RESPONSE BRANCH

For an outstanding contribution for enhancement of emergency preparedness of local government through development and transfer of the Computer-Aided Management of Emergency Operations (CAMEO) program.

AMES LABORATORY

FREDERICK A. SCHMIDT, DAVID T. PETERSON, JOHN T. WHEELOCK

For extraordinary initiative and effort in the developmental and market research stages of commercializing the thermite-reduction process.

ATLANTA VETERANS AFFAIRS MEDICAL CENTER

PASCAL MALASSIGNE, JAMES A. BOSTROM

For excellence and initiative in transferring to private industry bathroom fixtures for elderly and disabled persons, developed with Veteran Affairs sponsorship.

LOS ALAMOS NATIONAL LABORATORY

MAURICE W. COLLINS, RAYMOND L. ELLIOTT, NORMAN R. MORSE

For outstanding creativity and initiative in the development and transfer of the Common File System (Data Tree) to industry.

U.S. ARMY NATICK RESEARCH, DEVELOPMENT & ENGINEERING CENTER

DEIRDRE RAPACZ, STEPHEN FOSSEY

For initiative in commercializing advanced synthetic insulation material (Primaloft).

D.O.E. SOLAR ENERGY RESEARCH INSTITUTE

HELENA L. CHUM

For leadership and creativity in the formation of a laboratory-industry partnership to commercialize the biomass adhesives technology.

LAWRENCE LIVERMORE NATIONAL LABORATORY

ALAN K. BURNHAM, ROBERT L. BRAUN, JERRY J. SWEENEY

For formation of a Petroleum Geochemistry Consortium, licensing software to businesses, and collaborative research with an additional small firm.

PACIFIC NORTHWEST LABORATORY

DONALD M. BOYD, DOUGLAS K. LEMON, GARY E. SPANNER

For creatively involving the U.S. steel industry in the development and transfer of a temperature-measuring system tailored to meet industry needs.

LAWRENCE BERKELEY LABORATORY

ARLON HUNT

For developing, patenting and transferring to a start-up company the process of producing aerogel, a superior insulating material which reduces ozone destruction.

NASA/AMES RESEARCH CENTER

LEONARD A. HASLIM

For ingenuity and determination in developing and transferring the Electro-Expulsive Deicing System for government and commercial applications in the fields of aeronautics and shipping.

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

VLADIMIR HAMPL

For contributions to gaining acceptance of controls to reduce wood dust emissions in the wood-working and furniture industries.

BROOKHAVEN NATIONAL LABORATORY

LEONARD HAMILTON, PAUL MOSKOWITZ

For developing and promoting the use of Biomedical and Environmental Risk Assessment techniques by industry to meet environmental and safety requirements.

WRIGHT RESEARCH AND DEVELOPMENT CENTER

ARTHUR J. WENNERSTROM

For leadership, dedication and initiative in conceptualizing and transferring compressor low aspect ratio blading and swept technologies and making them industry standards.

UNITED STATES ARMY CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER

MARK L. ALTHOUSE, GARY L. DOGGETT

For outstanding initiative and dedication in the development and promotion of an innovative thermal imaging sensor for use as a cancer evaluation device

D.O.E. SOLAR ENERGY RESEARCH INSTITUTE

JAMES TANGLER, BRIAN SMITH, DAVID W. JAGER, EDWARD MCKENNA

For outstanding achievement in assisting industry to develop and commercialize advanced airfoil blades for wind turbines, thereby reducing wind energy costs and opening new markets for U.S. manufacturers.

SANDIA NATIONAL LABORATORIES

PETER O. WITZE, ELDON L. PORTER

For initiating an effective partnership with an instrument manufacturer and industry users that led to the rapid commercialization of fiber-optic instrumented spark plug technology.

BROOKHAVEN NATIONAL LABORATORY

MEYER STEINBERG

For unstinting and continuing efforts in promoting the HYDROCARB process for producing clean carbon fuels from coal up to the point of industrial acceptance and initial funding of a prototype system.

PACIFIC NORTHWEST LABORATORY

PAUL C. WALKUP, CHARLES A. ROHRMANN, DAVID E. EAKIN, RICHARD T. HALLEN

For creativity and perseverance in the unique transfer of a new technology to the sugar industry.

ROME AIR DEVELOPMENT CENTER

DOUGLAS A. WHITE, DONALD M. ELEFANTE, JEFFREY D. GRIMSHAW

For outstanding work in transferring Knowledge-Based Software Assistant technology to government and industry.

NASA/AMES RESEARCH CENTER

LEONARD A. HASLIM

For ingenuity and determination in the development and transfer of the Elliptical Seat Spring Assembly for government and commercial use in the aircraft, automobile and shipping industries.

U.S. FOREST SERVICE

JOHN M. HIGGS

For exemplary performance and delivery of forestry and forest products technology to timber resource owners and users.

Continued on page 6

FLC AWARDS PROGRAM RECIPIENTS

Continued from page 5

SANDIA NATIONAL LABORATORIES

ROBERT S. BLEWER

For his diligent work in stimulating the development and use of tungsten technology in the semiconductor manufacturing community.

NASA LANGLEY RESEARCH CENTER

JOHN H. CANTRELL, JR., WILLIAM T. YOST

For outstanding creativity in the design and development of a non-invasive ultrasonic burn depth instrument and transfer of the technology to the biomedical sector.

LAWRENCE LIVERMORE NATIONAL LABORATORY

JAMES M. BRASE

For unusual initiative and energy in distributing the image analysis and display computer code VIEW under collaborative agreements to a group of over 200 users.

KIRTLAND AFB WEAPONS LABORATORY

MICHAEL K. GLEICHER, ROBERT W. CONLEY

For the development of an algorithm for compressing supercomputer graphic files that has led to the Weapons Laboratory's first Cooperative Research & Development Agreement (CRDA) with the private sector.

NAVAL CIVIL ENGINEERING LABORATORY

T.Y. LEE

For outstanding dedication and creativity in the transfer of cogeneration and energy systems technology to the public and private sectors.

LAWRENCE LIVERMORE NATIONAL LABORATORY

VIKTOR E. HAMPEL

For exemplary imagination and initiative in developing the Intelligent Gateway Processor and simultaneously pursuing means for the widespread dissemination and application of the technology.

1989 AWARDS PROGRAM RECIPIENTS

The FLC NEWS

• FEDERAL LABORATORY CONSORTIUM FOR TECHNOLOGY TRANSFER • JUNE, 1989 VOL. 5 NO. 6

FLC AWARDS RECIPIENTS HONORED!!

l to r: Diana Jackson, H. Dana Moran, James H. Turner, James T. Hall, Margaret M. McNamara and Dr. Loren C. Schmid at the 1989 FLC Awards Banquet.

AWARDS BANQUET HELD

The FLC announced recipients of the annual awards program May 3, 1989 in Chicago, Illinois. The annual awards program includes three individual awards described below, and up to 30 "Awards for Excellence In Technology Transfer". Nominations for the awards are solicited annually from FLC member laboratories. Winners are evaluated by a panel of experts in technology transfer, including representatives from government, academe and laboratories. FLC Vice-Chair Peg McNamara, assisted by incoming Awards Committee Chair Diana Jackson, presented the awards. Chairman Loren Schmid personally congratulated the winners.

Those honored with Awards for Excellence are listed on pages 3 and 4.

HAROLD METCALF AWARD:

This award recognizes the sustained significant service to the Consortium, its programs and process, of an individual FLC Representative. The award is for service over a three- to five-year period. Mr. Metcalf was the first Federal laboratory program manager at the National Science Foundation, and instrumental in expanding the Department of Defense Consortium for Technology Transfer to the current government-wide FLC. This award recognizes Mr. Metcalf's contribution, as well as those of the former and future recipients. We are pleased to present the Metcalf Award to:

JAMES T. HALL, AGRICULTURAL RESEARCH SERVICE, USDA

For sustained service on the Consortium's Executive Committee and active participation in and strengthening of FLC program initiatives with small business.

FOOD FOR THOUGHT:
Excellence is achieved through dedication to a cause and a lot of hard work!!

The FLC NEWS congratulates each award recipient.

REPRESENTATIVE OF THE YEAR AWARD:

This award recognizes the individual FLC Representative who has made the most significant contribution to the FLC program during the past year. This year, we are happy to present this award to:

H. DANA MORAN, SOLAR ENERGY RESEARCH INSTITUTE

For insightful guidance as a member of the Consortium's Executive Committee, and program leadership at the local, regional and national levels.

AWARD OF APPRECIATION:

This award recognizes individuals, who are not FLC Representatives or alternates, for a notable contribution to the FLC. This year's recipient is:

JAMES H. TURNER, JR., US HOUSE COMM. ON SCIENCE, SPACE, & TECH.

For outstanding congressional staff leadership in preparing key legislation on technology transfer from federal laboratories to industry.

FLC AWARDS PROGRAM RECIPIENTS

The FLC Awards For Excellence In Technology Transfer were established in 1984. The award recognizes the excellence of federal laboratory employees, who have exceeded their responsibilities by their outstanding work in transferring technology to other organizations. These award winners are individuals whose activities clearly merit national recognition. The following individuals were honored by the Consortium:

NAVAL CIVIL ENGINEERING LABORATORY

KIT L. MACK

For outstanding dedication and creativity in the transfer of structural engineering analysis technology to the public and private sectors.

NASA LYNDON B. JOHNSON SPACE CENTER

SHAYLA E. DAVIDSON

For leadership, dedication and initiative in the transfer of NASA tracking and communications technology to the development of a Locator System for Wandering Individuals, primarily Alzheimer patients.

LOS ALAMOS NATIONAL LABORATORY

MICHAEL G. STOUT, U. FRED KOCKS, ANTHONY D. ROLLETT

For innovation in transferring methods of quantitative texture measurements to U.S. industry and for the usefulness of such measurements in predicting metal deformation.

NASA GODDARD SPACE FLIGHT CENTER

HAROLD P. FRISCH

For leadership, creativity, and initiative in the transfer of aerospace and interdisciplinary engineering analysis tools and methodologies to industrial and non-aerospace applications.

AIR FORCE ENGINEERING AND SERVICES LABORATORY

CHARLES J. CARPENTER

For development and creative transfer of the ferrous sulfate/sodium sulfide electroplating waste water treatment system.

AIR FORCE WRIGHT AERONAUTICAL LABORATORIES

JOHN W. HINES

For leadership, dedication and initiative in making the Very High Speed Integrated Circuits Hardware Description Language an industry standard, and in the transfer of this technology to both government and industry.

AMES LABORATORY, U.S. DEPARTMENT OF ENERGY

EDWARD S. YEUNG

For extraordinary effort in helping numerous private-sector recipients build and utilize a new laser-based polarimetric detector.

U.S. ARMY CORPS OF ENGINEERS - CERL

L. MICHAEL GOLISH, DORIS SHAW

For completing the first commercially successful software Cooperative Research and Development Agreement in the Army under the Technology Transfer Act of 1986.

BROOKHAVEN NATIONAL LABORATORY & ARMY ARMAMENT RD&E CENTER

PETER Z. TAKACS (BNL) & EUGENE L. CHURCH (A RD&E CTR.)

For their creative achievement in attracting x-ray mirror manufacturers to use unique measurement facilities to improve their products and surpass foreign competitors in the market for high technology optical research instruments.

ROME AIR DEVELOPMENT CENTER

SEYMOUR F. MORRIS, PRESTON R. MacDIARMID, ANTHONY J. FEDUCCIA, BRUCE W. DUDLEY

For excellence in conceiving, developing and publishing the RADC Reliability Engineer's Toolkit to transfer RADC technology developed over 30 years in the field of reliability.

ROME AIR DEVELOPMENT CENTER

JON B. VALENTE

For excellence in developing and promoting an innovative, sophisticated circuit analysis technique and in transferring this capability to the electronics community through a commercial organization.

SOLAR ENERGY RESEARCH INSTITUTE

MARGARET A. LEMKE, EDWARD S. SABISKY, JACK L. STONE, THOMAS SUREK, WILLIAM L. WALLACE

For initiative in developing and implementing a unique government/industry cooperative program in amorphous silicon to advance the U.S. photovoltaic technology base.

USDA, FOREST SERVICE, FOREST PRODUCTS LABORATORY

WILLIAM C. FEIST

For outstanding efforts in an ongoing nationwide technology transfer effort in exterior wood finishing, reaching many sectors of the American public and industry.

USDA, FOREST SERVICE

W. BRIAR COOK, ROBERT J. SIMONSON, DONALD D. STUDIER, RONALD L. COPSTEAD

For opening areas to safe and efficient timber harvesting by transferring Service-wide, and to private industry, Forest Service developed earth anchor technology using diversified, innovative methods.

HOUSEHOLD INSECTS RESEARCH GROUP USDA/ARS

RICHARD S. PATTERSON, RICHARD J. BRENNER ,PHIILIP G. KOEHLER, RICHARD W. WADLEIGH

For the novel approach of transferring new technologies to the public for suppressing urban pests.

NORTHERN REGIONAL RESEARCH CENTER USDA/ARS

GEORGE F. FANTA, WILLIAM M. DOANE

For developing and transferring to industry new absorbent polymer technology providing expanded domestic and export markets for surplus corn, increased domestic processing and value-added cornstarch products.

ARMY CHEMICAL RD&E CENTER

RANDOLPH LAYE

For outstanding initiative and dedication in the development and promotion of an innovative and sophisticated hand-held device to quantitatively assess respirator fit in the workplace.

OAK RIDGE NATIONAL LABORATORY

JAMES R. WEIR, JR.

For significant contributions to the development of technologies from interesting science, resulting in five nickel aluminide licenses and the development of marketplace interest in other technologies nationally and internationally.

NOAA/NATIONAL WEATHER SERVICE, SE AG WEATHER SERVICE CENTER

ROGER R. GETZ, KARL S. HARKER, DAVID M. IHLE

For technology development and transfer of agricultural weather information to Alabama Cooperative Extension Service for dissemination to county agents and growers.

PACIFIC NORTHWEST LABORATORY

RICHARD J. DOUTHART, JAMES J. THOMAS

For their outstanding dedication and creativity in transferring the CAGE/GEM TM technology to universities and industries throughout the United States.

PACIFIC NORTHWEST LABORATORY

L. JOHN SEALOCK, JR., E. G. (ED) BAKER, DOUGLAS C. ELLIOTT, R. SCOTT BUTNER

For developing an innovative alliance between a small business and the Pacific Northwest Laboratory to commercialize and transfer a novel waste management and energy production system to industry.

AIR FORCE GEOPHYSICS LABORATORY

GAIL P. ANDERSON, R. EARL GOOD, FRANCIS X. KNEIZYS, ERIC P. SHETTLE, GEORGE A. VANASSE

For establishing the first Air Force Cooperative Research and Development Agreement with a private company, thereby accelerating the transfer of software technology and resulting in an improved user-friendly product.

NAVAL UNDERWATER SYSTEMS CENTER

RICHARD A. DENOMME

For his dedication to technology transfer and tireless efforts in responding to requests for technical assistance from federal, state and local government officials.

TURNER-FAIRBANK HIGHWAY RESEARCH CENTER

ROBERT F. KRULL

For outstanding initiative and creativity in developing a "Roadshow" and UPDATE to transfer highway technology directly to city, county and state workers at all levels.

TURNER-FAIRBANK HIGHWAY RESEARCH CENTER

WILSON J. LINDSAY

For leadership, dedication and initiative in promoting and advancing the concepts of safer mailbox supports.

REHABILITATION R&D CENTER, PALO ALTO VA MEDICAL CENTER

DOUGLAS SCHWANDT

In recognition of his contributions, innovation and enthusiasm in the successful commercialization of the Handbike arm-powered bicycle for the disabled.

ARGONNE NATIONAL LABORATORY

DIETER M. GRUEN, MICHAEL J. PELLIN, CHARLES E. YOUNG

For inventing, patenting, and transferring to industry a revolutionary new laser technology for intraocular, cardiovascular, and other types of surgical applications.

LAWRENCE BERKELEY LABORATORY

VAN L. JACOBSON

For innovation in both research and technology transfer of algorithms that have significantly improved the performance of both local and wide area computer networks.

LAWRENCE BERKELEY LABORATORY

FREDERICK WINKELMANN, BRUCE BIRDSALL, W. FRED BUHL, KATHLEEN ELLINGTON, ENDER ERDEM

For developing, documenting, disseminating, and supporting the DOE-2 program for simulation of energy use in buildings, thereby transferring new conservation technology to private industry and government agencies.

APPENDIX II

FINANCIAL SUMMARY

FEDERAL LABORATORY CONSORTIUM FOR TECHNOLOGY TRANSFER

CALENDAR YEAR 1989 EXPENDITURES

The expenditures for the last quarter of CY1989 (or the first quarter of FY1990) have been identified.

PROGRAM ELEMENT	CY 1989	Last Quarter
	($1,000)	
Management and Administration		
Executive Management	$ 57.7	$ 14.0
Operations Management	211.3	53.8
Washington, DC Representative	128.6	19.4
Operations and Member Services		
Meeting support	74.3	20.7
Training	29.8	5.9
Communications	52.8	17.2
Clearinghouse	135.1	35.9
Outreach Program		
Outreach Materials & General Support	24.5	3.3
Exhibits	18.3	3.3
Demonstration Project	37.8 *	5.0 *
Special Projects	32.0	0.0
Regional Support	151.4	37.8
Total 1989 Expenditures	**$953.6**	**$216.3**

*** Represents disbursements only. Commitments for the first two demonstration projects total approximately $130,000.**

APPENDIX III

FY 1990 - ORGANIZATIONAL ELEMENTS

EXECUTIVE COMMITTEE:

Chairman: Dr. Loren C. Schmid
DOE-Pacific Northwest Laboratory
PO Box 999, MS KI-34, Richland, WA 99352

Vice Chairman: Ms. Margaret McNamara
Naval Underwater Systems Center
Code 107, Bldg. 80T, New London, CT 06320

Regional Coordinators:
Mr. Robert M. Barlow
NASA John C. Stennis Space Center
Code HA30, Stennis Space Center, MS 39529
Ms. F. Sinclair Ingalls
Air Force Wright R&D Center
WRDC-XO, WPAFB, OH 45433-6523
Mr. Nick Montanarelli
DOD Strategic Defense Initiatives Org.
SDIO/T/TNO, Washington, DC 20301-7100
Dr. William Marcuse
DOE-Brookhaven National Laboratory
Building 902-C, Upton, NY 11973
Mr. Robert P. Stromberg
DOE-Sandia National Laboratories
TT Org 410, Albuquerque, NM 87185-5800
Mr. Charles Miller
DOE-Lawrence Livermore National Lab
PO Box 808-L795, Livermore, CA 94550

NIST Representative:
Mr. Robert Chapman
DOC-National Institute of Standards & Technology

At-Large Members:
Mr. Len Ault
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Mr. Jerome Bortman
Naval Air Development Center
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DoAg-Agricultural Research Service
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Army Belvoir RD&E Center
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DOT-FAA Technical Center
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Mr. Clifford Lanham, DOD-Army Domestic TT Office

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Technology Consultant, Decatur, IL
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Battelle Memorial Institute, Seattle, WA
The Honorable S. Hankins
Washington State Legislature, Olympia, WA
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Rep. R.G. Polanco
California Assembly, Sacramento, CA
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Connector Systems, Santa Rosa, CA

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Code 107, New London, CT 06320

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Mr. Todd Zdorkoski
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Naval Air Development Center
Warminster, PA 18974-5000

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ARAC, Indianapolis, IN
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DOC-CUFT, Springfield, VA

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Mr. D. Ralston, DOI-Bureau of Mines
Mr. L. Ault, NASA
Dr. W. Butcher, NSF
Mr. J. Hohl, DOT
Mr. N. Montanarelli, DOD-SDIO

FLC:

Dr. L. Schmid, Dr. E. Stark, Ms. M. McNamara & Dr. B. Berger

FLC SUPPORT PERSONNEL:

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224 W. Washington, Ste. 3
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Sequim, WA 98382

FLC Administrator: Mr. D.M. DelaBarre

FLC Clearinghouse Mgr.: Mr. A. Sjoholm

FLC Washington, DC Representative

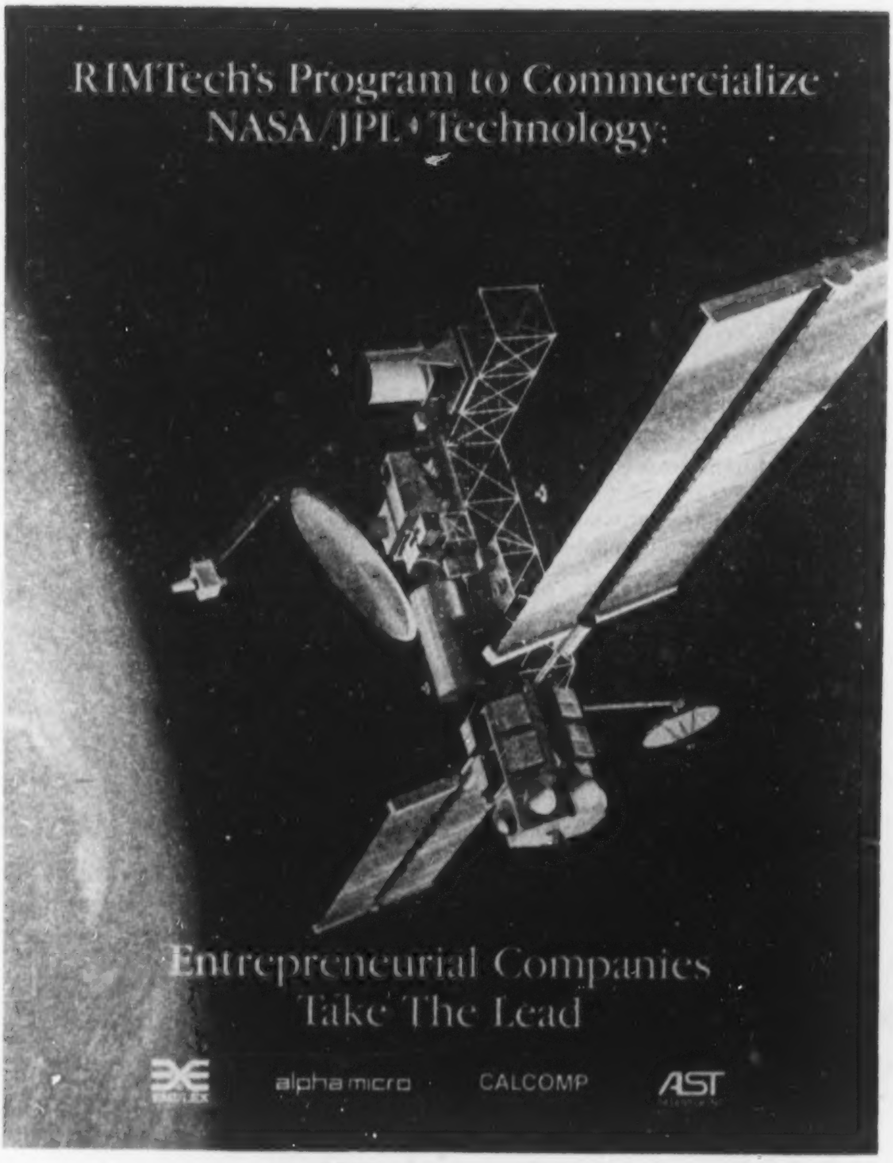
Dr. Beverly Berger
1550 "M" St., NW, 11th Floor
Washington, DC 20005

THE FEDERAL LABORATORIES

- **Comprise over 600 R&D laboratories and centers;**
- **Have annual in-house budgets of approximately $20 billion; and**
- **Employ approximately 1/6 of the Nation's research and development professionals.**

THE FEDERAL LABORATORY CONSORTIUM

Chartered by the Technology Transfer Act of 1986 to strengthen technology-based cooperation between the Federal laboratories and US business, universities, State and local governments, and the Federal agencies.



RIMTech's Program to Commercialize NASA/JPL Technology:

Entrepreneurial Companies Take The Lead

EMULEX alpha micro CALCOMP AST

"A Resource We Cannot Afford to Ignore"

SoCalTEN Companies Tap NASA's Jet Propulsion Lab for New Product Technology

By Andrew Paterson

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July 1986

When **Richard Cortese** set out to diversify **Alpha Micro Systems's** product line, he did not anticipate that NASA's Jet Propulsion Laboratory would prove to be a valuable ally. The company needed broader resources than it had to move into a new market it was exploring. "Technology is moving too fast now for us to rely solely on our internal resources," states Cortese.

Alpha Micro CEO Richard Cortese

"For $25,000 we found a new source of product technology and put a tremendous resource on staff," Cortese continues. "That's half the cost of an engineer. We were looking to leverage more out of our investment in R&D. JPL is in our backyard; it's a resource we cannot afford to ignore."

Through a pathbreaking program managed by **RIMTech** (the Research Institute for the Management of Technology), several companies are now exploring the transfer of technology and engineering "know how" from JPL in Pasadena for new product ideas.

"We were very pleased with the responsiveness and practical approach of JPL engineers," noted John Glade, Vice President of R&D for Alpha Micro Systems. "We didn't have their expertise in data compression which they developed operating deep space probes. Putting JPL on the team enables us to speed up the development of a next generation product."

CalComp President Bill Conlin

CalComp also sees JPL fitting into their long range plans.

"We have to think 3-5 years out: What new markets can we move into? What will customers need then? And what can we then feasibly engineer and deliver to that new market?," notes President **Bill Conlin**.

"JPL offers great leverage for our investment in developing new products. We were surprised by their response: their engineers rolled up their sleeves and dove right into the technical issues we raised."

Jerome Johnson, Director of Advanced Technologies, who heads **CalComp's** current project with JPL, amplified Conlin's remarks. "JPL has long had an excellent reputation for integrating technologies. Yet they're also pushing up against the frontiers of physics. These perspectives are very useful in brainstorming the development of new products."

Johnson continues. "When we're deciding which design directions to take, we try to look at where are we limited by our own engineering approach? Where do we need an outside perspective? Just the initial two hours in the private session at JPL produced three valuable ideas we had not considered because they've got capabilities in optics, for example, that we just don't have internally."

A National Resource

JPL is a national resource with an annual budget of $600 million and 3,000 engineers working in a broad array of disciplines. Unlike much university research, JPL must carry a pragmatic engineering approach in its research and complex projects because it faces tight launch windows and very unforgiving environments in space. What they make must work the first time.

Since the RIMTech program began in February, more than 40 companies, most from **SoCalTEN** (the Southern California Technology Executives Network, an active association of more than 100 chief executives), have visited the Lab in the monthly full day presentations of JPL technologies.

The four presentations since February at JPL covered these topics:

- Telerobotics
- Data Processing & Analysis
- Power Electronics
- Telecommunications
- Lasers & Optics
- Image Processing
- Sensors & Instrumentation

In the follow-up private sessions, companies explored their specific engineering interests in: VLSI and customized wafer fabrication, concurrent computing, chemical processing of pollutants, electro-optical devices, semiconductor lasers, imaging techniques, and data compression.

President's Perspective:

"Many technology transfer efforts failed in the past because they were some researcher's pet project in search of a market. The **RIMTech - JPL Product Development Program** is driven instead by the specific needs of the technology entrepreneur looking to develop a new product with a definite market in mind. Once RIMTech has assisted the company in identifying a technology fit with the Lab, the priority channel created by this program ensures that the Lab will respond expeditiously to the companys' interests.

RIMTech's Steve Panzer, Ph.D.

"To put it in perspective, the Japanese excel at transferring technology; for them it has proven to be a formidable weapon for economic advantage. Our program is an important step in addressing this competitive threat."

Companies Drive the Program

The most important step in the process of transferring technology is identifying the right fit between lab capabilities and company interests. In this program the companies drive the fit. Rather than ask JPL technologists what they think carries commercial potential, the company defines what it is looking for, then the lab responds.

As RIMTech Chairman **Dub Warren** explains, "There are thousands of answers at a place like JPL, but you have to be smart enough to ask the right questions."

RIMTech Chairman
W.D. (Dub) Warren

Based on reviewing two presentations at the lab, **Emulex** became the fourth company to join the annual RIMTech program. President **Steve Frankel** stated, "We like the research directions of the lab. They are in concert with certain of our directions and we look forward to working closely with them."

Emulex President
Steve Frankel

Gaining an International Edge

A burdensome "Not Invented Here" syndrome traditionally pervades many American companies; thus, many are oriented against transferring technology in from outside the organization. However, today's intensified international competition may be forcing a change in orientation.

Underscoring the importance of technology transfer in international competition, **Dr. Tom Walters**, JPL's Industry Liaison, comments, "Many of our scientists are frustrated after being turned down by American corporations, while Japanese firms offer them all expense paid trips to Tokyo to discuss commercialization ideas. This program carries a lot of promise to reverse this trend."

At a recent presentation of the program in Silicon Valley, Ned Olivier, General Partner of **Fairfield Ventures**, observed, "The irony is that if this program were opened to Japanese firms, they would turn out in busloads!"

Fairfield Ventures'
Ned Olivier

NASA Aims to Commercialize

JPL has an unparalleled track record in remote space exploration. In fact, the spectacular flyby of Uranus in January, engineered by JPL, was the most recent success of America's space program. JPL's main concern is *unmanned* space exploration, thus it has been impacted less by the launch stoppage than have other NASA centers.

As it gears up for the Space Station, NASA is aggressively pursuing industry to jointly develop major elements of the space program with the private sector. Hence, projects which commercialize JPL technology are important to NASA.

Despite budget pressures, NASA's Office of Commercial Programs, led by **Isaac Gillam**, has invested nearly $200,000 in the RIMTech JPL Program to leverage the investment individual companies make. The program has also gained the direct support of **U.S. Senator Pete Wilson** as well as funding from the California Department of Commerce, headed by **Christy Walters**. Adding to the bipartisan endorsement of the program are Congressmen **George Brown** and **Mel Levine**.

Model for Private Initiative

The teaming of NASA, government and industry leaders, and RIMTech provides a model for publicly supported private initiatives in other regions of the country.

Many states are striving to use technology transfer to diversify their local economies away from an overdependence on farming, oil, or steel and coal.

RIMTech's alliance with SoCalTEN has been a pivotal factor in the development of this model for other regions. SoCalTEN President **Bob Kelley** adds, "We believe the RIMTech program provides real value to our members at a time when technology companies are scrambling for competitive edges."

AST Founder Albert Wong

AST Research Founder **Albert Wong** sums up the momentum from industry behind the program. "Now is too late to be thinking about your next product. We were the first company into this program because it blends well with AST's long term approach to product development and provides us with a window on technologies that we want to stay on top of. We also believe this program is important to restoring America's competitiveness which we are committed to as well."

Technology Transfer to Solve Environmental Issues

Industry veteran Hal Gordy will head a subdivision of the RIMTech program which will focus specifically on utilizing technology transfer to address environmental issues. Managing hazardous materials has become a top priority issue not only for the public, but for technology industries in particular as they reexamine means to dispose of used solvents and noxious materials. The RIMTech program provides a vehicle to accelerate the implementation of helpful technologies for monitoring and cleaning up the environment.

SoCalTEN Director Hal Gordy

With 20 years of experience in the environmental management industry, he now serves as advisor for several emerging companies in the field. He has already identified several technologies at the Lab with immediate commercial potential.

According to Gordy, "Some of JPL's applications in remote sensing and chemical processing offer distinct advantages over the way things are done in the industry now."

How the RIMTech Technology Transfer Process Works

Companies evaluate their participation in the RIMTech program as follows:

- JPL hosts a series of full day presentations of its technologies.
- RIMTech and JPL visit the company to brainstorm specific interests.
- A private session is arranged at the lab for a tour of facilities and direct dialogue with JPL technologists to address the specific technical interests of the company. A proposed work statement is drafted based on this session if the company decides to participate.
- Company enters the program for a $25,000 annual participation fee; $15,000 is credited to the RIMTech program account for the company.
- Engineering tasks and/or facility usage begins for the company which are charged to the RIMTech program account. JPL engineers typically charge out at $450-$600 per day. Facility usage charges vary.

Companies interested in arranging a private session at JPL can reach Dr. Tom Walters at (818) 354-0365 or Andrew Paterson at (213) 476-0648.

Dr. Tom Walters
JPL [illegible]

Andrew Paterson
Director of Technology
Transfer Program—RIMTech

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For further information about the program, contact Dr. Steven Panzer, President; or Andrew Paterson, Director of the Technology Transfer Program, at the RIMTech offices in Los Angeles at (213) 476-0648.

RIMTech is a non-profit organization exempt from income tax under IRC section 501(c)(3).

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Photo Courtesy of Jet Propulsion Laboratories

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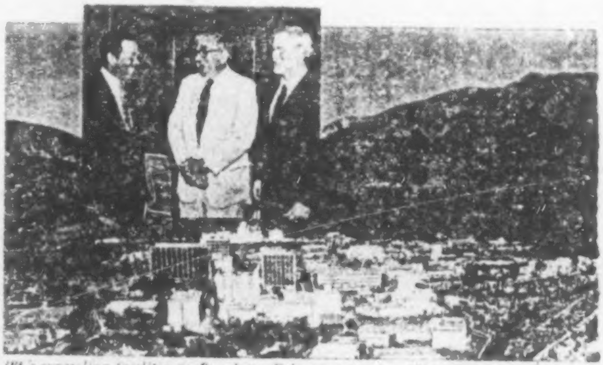
UPDATE

Business taps into NASA R&D

Because the high cost of R&D is often the biggest obstacle facing young high tech companies, gaining access to the technology base of a major research lab would appear to be a dream come true. But that's exactly the purpose of a program at NASA's Jet Propulsion Laboratory (JPL) in Pasadena, Cal. Under the program—which is administered by the Research Institute for the Management of Technology (RIMtech), a nonprofit organization in Los Angeles—a company first meets with JPL scientists to see how its technical problems match up with the lab's expertise. If the fit looks promising, the company pays RIMtech an annual fee of $25,000, and JPL starts working on solutions.

The program is part of an effort mandated by Congress to make tax-supported research more accessible to industry, says Daniel Schneiderman, head of JPL's space commercialization office, and is the first to focus on entrepreneurial firms. Since a test phase began last February, JPL has been working with several southern California companies. For example, computer maker Alpha Microsystems is trying to increase the capacity of its tape backup storage devices with the help of data compression techniques developed by JPL. And an unnamed company is evaluating the lab's water filtration technology for possible use in systems to filter drinking water.



JPL's sprawling facilities in Pasadena, Cal., are now accessible to young technology firms. Inset (left to right): NASA Assistant Administrator Isaac Gillam IV, U.S. Rep. George Brown (D-Riverside), and RIMtech president Steven Panzer convened to announce the program.

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